Wis P Bemis

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Administration
Bureau of Plant Industry, Soils, and Agricultural Engineering

THE NATIONAL POTATO-BREEDING PROGRAM 1951

By

Division of Vegetable Crops and Diseases
and
the State Cooperators

(Twenty-second Annual Report to Cooperators)

Plant Industry Station
Beltsville, Md.

March 1952

TABLE OF CONTENTS

Page

****

NATIONAL POTATO-BREEDING PROGRAM, 1951

By F. J. Stevenson

To some cooperators the annual report of the National Potato-Breeding Program includes too many details; others have suggested that we include more data.

The object of the report has been to produce in one volume a permanent record of the potato-breeding and related activities in every State and Territory of the United States. We should like to include a summary of each activity and enough data to show the extent and nature of the work. There is no set rule as to what should be included. In most cases we include the reports as they are received with a minimum of editing; in others, we summarize the data, being careful not to exclude anything that we think might be helpful to other cooperators. A complete file of these reports makes a handy reference, giving an account of the potato-breeding work in the United States since the National Potato-Breeding Program was organized in 1929.

The report this year emphasizes as usual the various horticultural characters, such as yield, market quality, and starch content or dry-matter content of tubers as measured by specific gravity. In some States, such as Maine, an unusual amount of rain resulted in very high yields, heavy losses from late blight in commercial fields, and an excess of oversize rough tubers.

Some of the yields in the test plots on the Aroostook Farm were exceptionally high. B 2368-4, a Red medium-maturing scab-resistant variety, yielded at the rate of 922 bushels of U. S. No. 1 tubers per acre. B 2368-11, a red scab-resistant variety, yielded at the rate of 850 bushels of U. S. No. 1 tubers per acre. Many of the tubers of B 2368-4 were oversize and rough, but the market quality of B 2368-11 was good. Many comparisons of the new versus the old varieties are to be found in the various tests.

Starch Content (Specific Gravity)

The starch content varied as usual. At Lewiston, Idaho, Chippewa with 14.4% starch would classify as a baker. Kennebec produced 15.1%; White Rose, 15.7%; and Triumph, 13.6%. At Parma, Idaho, Kennebec had a starch content of 15%; White Rose, 14.7%; and Russet Burbank, 15.9% --all high enough for bakers. On the dryland tests at Tetonia, starch content was very low: Russet Burbank, 9.7%; Kennebec, 9.1%; and White Rose, 7.2%. On verticillium-wilt-sick soil on the Egin Bench, Russet Burbank produced 10% starch; Menominee, 12%; and White Rose, 8%. At Shafter, Calif., White Rose produced 15.9% starch; Kennebec, 16.7%; and

Katahdin, 15.4%. The wide variability found in the same variety grown under different environmental conditions is further evidence of the futility of trying to indicate cooking quality by giving the variety name alone.

Late Blight

The 1951 season brought the late-blight problem to the front again. Some of the States, such as Nebraska, had unusual outbreaks of the disease. In Maine unusual amounts of rainfall interfered with spray programs, with the result that heavy losses occurred in the susceptible varieties. The value of blight-resistant varieties was demonstrated by the Kennebec. Thousands of acres of this variety were grown without fungicidal sprays, and in only a few instances was blight found on this variety. In several other fields in which blight was reported, it was found on varietal mixtures but not on the Kennebec plants.

Should Kennebec be sprayed with a fungicide?

In tests with various sprays in Maine (Plant Industry table 15) in plots in which a blight epidemic prevailed on the susceptible varieties, Kennebec yielded at the rate of 780 bushels per acre of U. S. No. 1 tubers sprayed with DDT alone, and 773 bushels, sprayed with bordeaux + DDT. The results for 1949, 1950, and 1951 have been very consistent, showing that varieties with the resistance of Kennebec can be grown in Maine without fungicidal applications. However, a warning can be taken from the report of W. R. Mills, of Pennsylvania, cooperating with L. C. Peterson, of Cornell University. This report gives us an excellent condensed summary of their work with late blight. Kennebec, Cherokee, Essex, and a number of other varieties carry the D factor, which conditions resistance against what was once the common races but which makes them susceptible to race D. This race D is rapidly becoming the common race in Pennsylvania, and the growers in that State spray Kennebec, Essex, and others carrying the D gene just as they do any susceptible variety.

Mills and Peterson say that the D gene only is useless but the problem is not a hopeless one, since they have seedling varieties that are immune to all five races.

A few seedlings produced at Beltsville seem to be immune from all the races Dr. Schultz has found. These have been tested also by Peterson at Cornell University and Mills at State College against the races with which they are working. In Dr. Mills' tests, four showed an immune reaction to all five races B, C, and D, and BC and BD. One of these seedlings, B 922-6, is early and is promising commercially but does not yield enough. In the Maine plots in 1951 it yielded 561 bushels per acre of U. S. No. 1's as compared with 617 for Irish Cobbler. The percentage of starch in the seedling was 13.6; that of the Cobbler, 12.8. Because of the prevalence of late blight in many States nearly

all breeders have included resistance to this disease as a major project in their program. They can profit by reading the reports from New York, Pennsylvania, Minnesota, Iowa, Louisiana, and Maine.

Scab

Slow but steady progress can be seen in the reports showing the development of scab-resistant varieties. In 1951 a number of the scab-resistant varieties were tested for yield and other characters in Maine. The highest yielding white-skin variety was a scab-resistant sort. One red-skin variety also produced a rather phenomenal yield. Many stations are breeding for scab resistance in both red and white varieties. The scab-resistant varieties, such as Ontario and Cherokee, are serving a purpose but it is evident from the many reports that better varieties are in the making.

Verticillium Wilt

Verticillium wilt, an old disease that attacks not only potatoes but mint and cotton, has been receiving a lot of attention in recent years. It has been called "die early" in the Pacific Northwest where it has been taking a heavy toll from potato growers for many years. It is only a few years ago that the causal organism was recognized as a verticillium, but since then everyone is on the alert for it. It is possible in the future that a commercial variety that is highly resistant will be needed for those potato soils with a high level of infestation. A preliminary test in Maine indicates that such a variety may be produced. Dr. McLean, Aberdeen, Idaho, is carrying on a relatively extensive program with resistance to verticillium wilt as a major objective. He has found a number of varieties that show tolerance.

Most of the commercial varieties, such as Russet Burbank, Kennebec, Katahdin, Green Mountain, and White Rose, are susceptible.

Virus Diseases

The new development in the work of virus diseases is the report of Darby, Larson, and Walker of Wisconsin, on the variation in virulence and properties of potato virus Y strains. (See Wisconsin report). Seed of two introductions that should produce seedlings segregating for hypersensitivity to the Y virus has been received from K. O. Müller, Cambridge, England.

Leaf Roll

Another report from Wisconsin by Webb, Larson, and Walker indicates that there are strains of the leaf roll virus.

The work of breeding for resistance to leaf roll is being continued. (See reports of Simpson and Bonde, and Folsom, Maine). Most of the selections that do not become infected for a number of years seem to come from

crosses invclving Imperia or Kepplestone Kidney. One of the most resistant seedlings is B 24-58, a selection from Imperia x Earlaine. It is usually field-immune but in 1951, 13 percent of its plants became infected under severe conditions for spread, as shown by 99% infection in Green Mountain, 98 in Chippewa, and 78 in Katahdin. (See Folsom, Maine, report.). The results are promising, but the problem is a complicated one, since after testing thousands of seedlings only a very few seem worthy of further trial from the commercial standpoint.

Net Necrosis

Net necrosis is the disease caused by current-season infection with the leaf roll virus. Some varieties are immune, others are highly resistant, and still others are very susceptible. In a test in Maine (see Plant Industry table 18), Green Mountain showed 44.1% net necrosis; Cherokee, 7.7%; Sebago, 3.5%; and Kennebec, 0.0%.

Physiological Internal Tuber Necrosis

Differences were found among seedlings and varieties in their susceptibility to the nonparasitic internal tuber necrosis in late-planted potatoes. Ontario was the most susceptible, with an index of 64.2; Katahdin, 45.6; Cherokee, 1.7; and Kennebec, 9.4. (See report, Wisconsin, by Larson and Akeley).

New Varieties

No new varieties were released in 1951, but it is interesting to note that some of the more recent introductions are on the increase. The seed certification summary for 1951 showed that Kennebec increased the most, with a total of 1,868,461 bushels of certified seed; Progress, 161,461 bushels; Waseca, 69,256; Satapa, 3,820; Cherokee, 31,842; LaSoda, 28,297; DeSoto, 22,955; White Cloud, 9,911; and Pungo, 75 bushels.

PLANT INDUSTRY STATION (Beltsville, Md.) and CHAPMAN AND AROOSTOOK FARMS (Presque Isle, Maine)

By F. J. Stevenson, R. V. Akeley, and E. S. Schultz

Plant Industry Station

In 1951 the potato-breeding work at the Plant Industry Station was continued. Seed of new crosses and selfed lines was produced and seedlings were grown to maturity in the greenhouse; potato seed, seedlings, and named and numbered varieties were distributed to State agricultural experiment stations and to foreign countries. Seedling varieties were tested for immunity from virus X; others were tested for immunity from the more virulent races of late blight. Data and reports were assembled and analyzed, and the twenty-first annual report to cooperators was prepared and distributed.

Seed Production

Conditions were again favorable for the production of seed, and a relatively large number of crosses and selfed lines were made. The work with wild species was expanded, and seed of several species hybrids was produced, but so far no seed of Solanum polyadenium x S. tuberosum has been produced.

New Seedlings

In 1951, 78 crosses and 30 selfed lines were grown. The total number of seedlings was approximately 50,000. In these crosses and selfed lines new combinations of the following characters are being sought: Tuber color, earliness, dry matter, russet skin, vitamin C content, and resistance to viruses A, X, Y, leaf roll, scab, late blight, verticillium wilt, ring rot, brown rot, hopperburn, and aphid injury. The parents are selected from the various tests, and each cross and selfing is made for a definite purpose. If the objective in growing a cross is the production of a new variety, selection for tuber shape, color, and russeting eliminates a relatively large number of seedlings. If, on the other hand, the objective is to study the breeding behavior of certain characters, the family line is harvested without selecting for horticultural characters.

Distribution

The distribution of seed, new seedlings, and named and numbered varieties is given in Plant Industry tables 1 to 4.

Foreign Introductions

In 1951 seed of two lines was obtained from K. O. Müller, which according to his tests show a hypersensitive reaction to all strains of virus Y.

Bintje, a variety very popular in a number of European countries, has been introduced from Denmark. It is yellow-fleshed but highly prized in Europe for its quality. It is not resistant to the major potato diseases. Twenty

seedling varieties from the Max Planck Institut have just been released from quarantine at Glenn Dale, Md. These are supposedly resistant to late blight.

Plant Industry table 1. Distribution of potato seed to State agricultural experiment stations in 1951.

State station	Cooperator	Progenies
Louisiana	T. P. Dykstra	23
Maine	R. V. Akeley	32
Michigan	E. J. Wheeler	24

Plant Industry table 2. Distribution of new seedlings from greenhouse at Beltsville, Md., in 1951

Station	Cooperator	Progenies No.	Seedlings No.	Kind of test -- resistance to:
Idaho	John G. McLean	32	5,391	Adaptation and verticillium wilt.
Louisiana	T. P. Dykstra	11	1,440	Scab, early and late blight.
Maine	G. W. Simpson	22	7,640	Leaf roll.
Maine	Robert V. Akeley	96	26,133	Scab, blight, and viruses.
Michigan	E. J. Wheeler	13	1,858	Scab.
North Dakota	Wm. G. Hoyman	30	4,859	Adaptation and scab.
Ohio	J. P. Sleesman	7	974	Hopperburn.
West Virginia	K. C. Westover	7	1,377	Yield and scab.

Plant Industry table 3. Distribution of named and numbered varieties of potatoes to foreign countries.

Country	Cooperator	Named or numbered varieties
		No.
Argentina	Domingo R. Pasquale	30
Canada	Robert A. Baker	17
Canada	N. Shendervich	10
Colombia	J. G. Hawkes	2
Denmark	Borge Jacobsen	21
Ecuador	R. M. German	14
England	J. G. Hawkes	6
Guatemala	Francis J. LeBeau	10
India	R. M. Sundaram	12
Palestine	Yehuda Lowe	18
Spain	Miguel Odriozola	26

Plant Industry table 4. Distribution of named and numbered varieties to States.

State	Cooperator	Named or numbered varieties
		No.
Alabama	Charles I. Isbell	14
California	Glen N. Davis	60
Colorado	W. C. Edmundson	83
Connecticut	Arthur Hawkins	13
Delaware	E. P. Brasher	20
Florida	Frank V. Stevenson	43
Florida	A. H. Eddins	43
Georgia	C. E. Felton	1
Indiana	Robert E. Lucas	2
Indiana	Kent Ellis	61
Iowa	C. L. Fitch	1
Iowa	C. E. Peterson	78
Kansas	Claude L. King	13
Louisiana	T. P. Dykstra	5
Maryland	R. A. Jehle	5
Massachusetts	Karl Koch	6
Do	Ralph W. Donaldson	12
Minnesota	M. J. Thompson	9
Do	O. C. Turnquist	11
Michigan	E. J. Wheeler	29
Nebraska	H. O. Werner	4
North Carolina	Fred Cochran	54
North Dakota	Harold Mattson	44
Do	R. C. Hastings	1
New Hampshire	Paul T. Blood	3
New Jersey	John C. Campbell	6
New York	L. C. Peterson	15
Do	M. W. Meadows	9
Ohio	J. P. Sleesman	9
Do	John Bushnell	8
Pennsylvania	W. R. Mills	13
Do	R. E. Hartman	29
Do	J. S. Cobb	15
Rhode Island	T. E. Odland	25
South Carolina	W. M. Epps	6
Do	T. W. Bennett	1
South Dakota	L. T. Richardson	9
Virginia	M. M. Parker	21
Do	F. S. Andrews	22
Washington	C. L. Vincent	1
Wisconsin	Jim Weber	4
Do	R. Hougas	1
Do	Fred Meyer	8
Do	R. H. Larson	19
West Virginia	K. C. Westover	22

Chapman Farm, Maine

In 1951, 26 named and numbered varieties were increased on the Chapman Farm (2.5 acres), and 2,467 seedlings were grown in 10-hill rows and 26,000 in single hills. The single hills were grown from true seed to mature tubers in the greenhouse at Beltsville, Md., in the fall of 1950. The germination of the single-hill tubers was 98.3 percent, and 9.4 percent of these were selected for disease resistance tests in 1952. Altogether, 96 family lines were grown and selections were made from 90 of them. Plant Industry table 5 gives a summary of the selections made from the single hills and the number planned for each test in 1952.

Plant Industry table 5. A summary of single-hill seedlings grown on the Chapman Farm in 1951, showing the number of seedlings planted, the number that produced plants, the number selected, and the number intended for the 1952 disease-resistance tests.

Seedlings			Selections to be tested in 1952							
Planted	Grown	Selected	Late blight	Scab	Ring rot	Virus X	Virus A	Virus Y	Verticillium wilt	Leaf roll
No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
26,000	25,556	2,410	1,953	1,574	699	949	463	134	525	106

Maturity and fertility data were taken on the 10-hill seedling varieties grown on the Chapman Farm in 1951. Plant Industry table 6 gives the summary of maturity and fertility data for these seedlings. Over 71 percent of the seedling varieties were medium or earlier in maturity, and 56 percent showed from slight to good fertility.

Plant Industry table 6. Maturity and fertility data for seedling varieties grown in 10-hill or multiple 10-hill rows on Chapman Farm, 1951.

Maturity classes	Seedlings		Fertility classes	Seedlings	
	No.	Pct.		No.	Pct.
Very early	132	5.8	None	1,047	44.0
Early	533	23.4	Slight	198	8.3
Medium	961	42.1	Medium	241	10.1
Late	624	27.4	Good	893	37.6
Very late	30	1.3			
Total	2,280	100.0		2,379	100.0

Yield Tests
Aroostook Farm

In 1951, 6 new varieties from State experiment stations and 7 named and numbered varieties from Canada were tested for yield, specific gravity, and other characters in 6 replications of 20 hills each in comparison with 3 standard varieties, Chippewa, Irish Cobbler, and Katahdin. The data for yield, percentage of U. S. No. 1 tubers, and percentage of starch are found in Plant Industry table 7.

Plant Industry table 7. Yield, percentage of U. S. No. 1 tubers, and percentage of starch of early and late varieties of potatoes in comparison with Irish Cobbler on Aroostook Farm, Maine, 1951.

Variety	Maturity	Origin	Yield per acre		Starch 1/	Remarks
			U. S. No.1			
			Bu.	Pct.	Pct.	
Canoga	L	N.Y.	659	95	15.0	Good quality.
Chippewa	M	USDA	660	93	11.4	Resistant to viruses A and Y and to net necrosis.
Chisago	M	Minn.	487	96	11.8	White, fairly smooth.
I. Cobbler	E	----	638	93	13.0	Immune from mild mosaic.
Katahdin	L	USDA	686	97	13.8	Immune from mild mosaic, and net necrosis.
Progress	E	Nebr.	593	91	12.6	Red, many tubers rather small.
Satapa	M	Minn.	584	97	12.1	Pale red, smooth.
Waseca	M	Minn.	622	97	11.0	Red, medium smooth.
White Cloud	M	Nebr.	545	92	13.3	White tuber.
B 211-NB 2	LL	N.Y.	600	98	11.7	Large, rough tubers.
F 346	L	Canada	662	97	14.7	Blight resistant, large rough tubers.
Canso (F 391)	L	do	617	96	13.4	Blight resistant
Keswick (F431)	M	do	641	97	13.7	Do
F 451	L	do	592	93	15.2	Do
F 4419	L	do	603	95	13.4	Do
F 44519	LL	do	556	94	15.5	Do
ISD 5% level			91		0.05	
ISD 1% "			120		0.07	

1/ The percentage of starch was based on the specific gravity of the tubers.

Chisago, Progress, Satapa, White Cloud, F 451, and F 44519 yielded significantly less than Katahdin. Canso and Keswick, two varieties produced at the Agricultural Experimental Station, Fredericton, New Brunswick, Canada, looked promising.

Progress, a Nebraska production, had satisfactory color, but the tuber set was very large, and the tubers were rather small. In a less favorable growing season many of them, no doubt, would grade U. S. No. 2. It was

lower in starch content than Katahdin. Satapa, a Minnesota production, was pale red. The color was not dark red enough to compete on a red market with such varieties as Progress or Red McClure grown in Colorado. Waseca, another Minnesota production, was redder than Satapa, but it had a lower starch content than that for Chippewa.

Eighteen numbered seedling varieties, most of them medium in maturity and selected because of their resistance to various diseases, were tested for yield, specific gravity, and other characters in 5 replications of 20 hills each in comparison with Chippewa. Some of these produced very large yields. For example, B 2368-4 yielded at the rate of 922 bushels per acre but, as was the case with many high-yielding types in 1951, many of the tubers were oversize and rough.

B 2368-11, a red scab-resistant variety, yielded at the rate of 850 bushels per acre. Its market quality was good for this season, but its starch content was rather low.

B 922-3 is apparently immune from a number of the more virulent races of late blight. It is medium in maturity and yielded satisfactorily, but its tuber shape and starch content were below par.

The data for this test are given in Plant Industry table 8.

Eleven seedling varieties that matured earlier than Irish Cobbler, six that matured in the same season, and one that was classified as medium in maturity were tested in comparison with Irish Cobbler in 5 replications of 20 hills each.

The data for this test are given in Plant Industry table 9.

B 515-2, a very early scab-resistant, long, russet-tuber variety yielded about the same as the Irish Cobbler, but some of the tubers were oversize and rough. This variety has been of considerable interest in North Dakota and in certain districts of Idaho.

B 915-6 produced a medium-long type tuber and gave the highest yield among the earlies.

B 922-6 seems to be the best variety so far produced that is immune from a number of the virulent races of late blight. It is early, and while it did not equal Irish Cobbler in yield its starch content was higher. Its market quality was above average.

Seven late- and one medium-maturing varieties were tested in comparison with Katahdin in 5 replications of 20 hills each. The data for this test are given in Plant Industry table 10. A number of these are interesting from the standpoint of disease resistance, but none of them was outstanding in yield.

Plant Industry table 8. Yield and percentage of U. S. No. 1 tubers and percentage of starch of varieties of potatoes in comparison with Chippewa on Aroostook Farm, Maine, 1951.

Variety	Maturity	Yield per acre U. S. No. 1		Starch 1/	Characters
		Bu.	Pct.	Pct.	
Chippewa	M	743	94	10.8	Immune from mild mosaic and net necrosis.
B 381-2	M	464	93	12.8	Red, scab-resistant.
B 606-37	M	747	98	14.3	Immune from viruses X and A, and blight-resistant.
B 607-56	M	743	98	11.2	Resistant to blight and ring rot.
B 725-8	L	683	97	11.6	Ring-rot resistant.
B 911-10	L	650	96	11.3	Do
B 922-3	M	671	97	10.0	Resistant to virulent races of late blight.
B 926-9	M	717	97	11.0	Immune from viruses A and X and scab-resistant.
B 2067-18	M	677	95	12.3	Resistant to scab.
B 2333-8	M	661	95	10.4	Resistant to scab and blight.
B 2346-20	L	742	98	11.0	Do
B 2368-4	M	922	99	13.0	Resistant to scab.
B 2368-11	M	850	96	10.5	Red, resistant to scab.
B 2392-11	E	603	92	10.3	Scab and blight-resistant.
B 2425-4	L	724	99	11.0	Blight-resistant.
B 2425-26	L	855	99	9.7	Do
B 2431-29	M	585	86	12.0	Blight-resistant in vines.
B 2431-42	M	712	97	12.5	Blight-resistant.
B 2431-43	M	592	89	12.3	Do
L.S.D. 5% level		83		.04	
L.S.D. 1% "		110		.05	

1/ The percentage of starch was based on the specific gravity of the tubers.

Plant Industry table 9. Yield and percentage of U. S. No. 1 tubers and of starch of early variety yield test in comparison with Irish Cobbler on Aroostook Farm, Maine, 1951.

Variety	Maturity	Yield per acre U.S. No. 1		Starch 1/	Characters
		Bu.	Pct.	Pct.	
Irish Cobbler	E	617	95	12.8	Immune from mild mosaic.
B 515-2	EE	626	97	11.0	Russet skin, scab-resistant.
B 605-10	EE	701	98	12.5	Blight-resistant.
B 773-8	EE	615	96	12.6	Blight- and scab-resistant.
B 915-6	E	819	97	11.5	Ring-rot resistant.
B 920-5	EE	647	97	9.2	Ring-rot, blight- and scab-resistant.
B 920-7	EE	617	95	12.0	Blight- and scab-resistant.
B 922-6	E	561	96	13.6	Resistant to virulent races of blight.
B 953-8	E	593	95	14.8	Immune to viruses A and X.
B 962-3	E	647	97	13.4	Scab- and blight-resistant.
B 962-32	EE	551	93	13.2	Do
B 991-3	EE	643	97	11.2	Do
B 991-14	EE	629	98	12.5	Do
B 2328-8	EE	730	96	10.6	Do
B 2368-6	EE	696	96	9.2	Scab-resistant.
B 2368-7	M	630	94	10.5	Slightly scab-resistant.
B 2425-21	E	772	99	10.8	Blight-resistant.
B 2428-84	E	562	92	12.2	Do
B 2431-51	EE	619	92	10.0	Blight-susceptible.
L.S.D. 5% level		50		.05	
L.S.D. 1% "		67		.07	

1/ The percentage of starch was based on the specific gravity of the tubers.

Plant Industry table 10. Yield, percentage of U. S. No. 1 tubers, and percentage of starch of late variety yield test in comparison with Katahdin.

Variety	Maturity	Yield per acre U. S. No. 1		Starch 1/	Characters
		Bu.	Pct.	Pct.	
Katahdin	L	615	95	13.4	Mild-mosaic and net-necrosis resistant.
B 931-2	M	639	97	11.0	Immune from virus X and blight- and ring-rot resistant.
B 936-12	L	638	94	12.5	Immune from virus X and resistant to leaf roll.
B 962-16	L	576	98	13.5	Scab- and blight-resistant.
B 2067-1	L	600	91	14.4	Light red and scab-resistant.
B 2140-21	L	610	97	14.3	Scab- and blight-resistant.
B 2391-11	L	660	92	13.3	Do
B 2431-33	L	602	87	13.3	Blight-resistant.
B 2574-25	L	444	97	12.0	Do
L.S.D. 5% level		66		.05	
L.S.D. 1% "		88		.07	

1/ The percentage of starch was based on the specific gravity of the tubers.

Late Blight Resistance

During May and June of 1951, 96 family lines, or 1,551 seedlings, were planted in 3-inch pots in the greenhouse at Aroostook Farm, Maine. Soon after the seedlings emerged they were transferred to a bench that was inclosed with a cage in which there was an automatic humidifier to keep conditions favorable for blight infection. These seedlings were then inoculated several times at intervals of a day or two with the common race of late blight. During the week of August 20, 5 tubers of each of the seedlings in the foliage test on the Chapman Farm were harvested from duplicate plots, and within 2 days were placed in the same greenhouse cage and inoculated with the common race of late blight for the tuber rot test.

Plant Industry table 11 gives a summary of these data. Approximately 54.5 percent, or 845 seedlings, were rated 0, or free from late blight in the foliage test. The other 45.5 percent, or 706 seedlings, were susceptible. In the tuber-rot test, 1,532 seedlings were inoculated. About 36.7 percent, or 562 seedlings, remained free from tuber rot, and 11.6 percent, or 178 seedlings, showed only slight infection.

Plant Industry table 11. Summary of the data obtained on the tests for resistance to late blight in the greenhouse at Presque Isle, Maine, 1951.

Varieties	No.	Foliage test 1/		Tuber classes 2/						
		S	O	No.	0	1	2	3	4	5
Seedlings	1,551	706	845	1,532	562	178	145	158	218	271

1/ The blight data for 1951 were taken in two classes: S, infected; O, not infected.

2/ Tuber classes:

0 = No rot on any of the tubers.
1 = One out of five tubers with late-blight rot.
2 = Two " " " " " " "
3 = Three " " " " " " "
4 = Four " " " " " " "
5 = Five " " " " " " "

Scab Resistance

In 1951 the scab test was again planted in the same field as in previous years on the Aroostook Farm, Maine. This year 92 family lines, representing 1667 seedlings, were compared with the susceptible Green Mountain checks. Single-hill seedlings, alternating with the checks, were planted in order to have room for all the material. The field used is usually very dependable and uniform for scab infection. This season was no exception.

Of the 1,667 seedlings tested, 231 showed only a trace of their surface covered with scab at harvesttime, and 857 had a mean coverage of 10 percent. These two classes represent 1,088 seedlings, or 65.3 percent of the total number. All but 4 of the alternate 1,667 hills of Green Mountain checks showed coverage of 30 percent of No. 3 pustules or higher. Of the 4 exceptions, 3 had type 3 pustules or higher, and one had type 2. Assuming pustule types 1 and 2 as resistant, then 870 seedlings (52.2 percent) are more resistant than the checks.

Plant Industry table 12 gives a summary of the data obtained for the 1951 scab tests.

Plant Industry table 12. Summary of the data obtained from the scab tests on the Aroostook Farm, Maine, in 1951.

Material tested	No.	Surface area covered 1/						Type of pustule 2/			
		T	1	2	3	4	5	1	2	3	4
Seedling varieties	1,667	231	857	390	167	22		413	457	695	102
Green Mountain checks	1,667	---	4	257	1,061	341	4	---	1	1,029	637

1/ Surface area covered
T = Less than 1%
1 = 1 to 20%
2 = 21 to 40%
3 = 41 to 60%
4 = 61 to 80%
5 = 81 to 100%

2/ Type of pustule
1 = Small, superficial
2 = Larger, but still superficial.
3 = Large, rough pustules
4 = Large pustules, shallow holes
5 = Large " deep holes

Verticillium Wilt

R. V. Akeley, D. Folsom, and R. Bonde

Verticillium wilt, an old potato disease showing up under changed cultural conditions, has been receiving considerable attention for several years in Maine. It is possible in the future that a commercial variety that is highly resistant to verticillium wilt will be needed for those potato soils with a high level of infestation.

With this in mind, a preliminary test was set up on the Ashby Farm, Caribou, Maine, to test some of the varieties and seedlings for resistance to verticillium wilt under northern Maine conditions. In 1951, five-hill plots of each seedling or variety were planted on soil showing approximately 30 percent infection in the Katahdin variety the previous year.

Two hundred eighty-two seedlings, representing 20 family lines, with a wide range of parents were included, and 193 selections from the breeding and increase plots. The Katahdin and Kennebec varieties were spotted in the field at intervals of 10 rows or 37 times. Readings were taken on the 7th and 16th of August. Before a final reading could be taken, the entire test was killed with a Sinox General spray. More susceptibles might have been eliminated if natural growth had continued longer.

The data from this test are shown in Plant Industry table 13.

Plant Industry table 13. Verticillium wilt resistance test --5-hill plots on the Ashby Farm, Caribou, Maine, 1951.

Pedigree No.	Parentage	Selections tested	Selections infected	Selections infected	Readings based on total No. hills		Hills infected
					infected	Free	
		No.	No.	Pct.	No.	No.	Pct.
B 2848	B 446-8 x Furore	1	0	00.0	0	5	00.0
B 2862	B 381-2 x B 594-46	8	4	50.0	10	27	37.0
B 2865	B 402-1 x B 381-2	5	2	40.0	5	20	20.0
B 2872	(X 528-170) x B 381-2	2	2	100.0	5	5	50.0
B 2878	B 56-11 x B 874-15	4	2	50.0	5	15	25.0
B 2879	B 381-2 x B 874-15	7	2	28.5	7	28	20.0
B 2881	B 874-15 x B 400-1	11	3	27.3	7	48	12.7
B 2882	B 874-25 x X 528-170	6	4	66.6	12	18	40.0
B 2884	B 874-108 x B 874-118	5	1	20.0	1	24	4.0
B 2885	(X 528-170) x B 766-45	3	2	66.6	3	12	20.0
B 2886	B 886-1 x (X 528-170)	1	1	100.0	2	3	40.0
B 2903	(X 96-56) x (X 528-170)	34	32	94.1	101	69	59.4
B 2910	B 595-183 x B 606-3	17	15	88.2	37	48	43.5
B 2914	B 595-76 x B 606-3	15	8	53.3	18	57	24.0
B 2915	B 595-76 x (X 528-170)	21	19	90.5	43	62	40.9
B 2921	B 607-56 x (X 528-170)	15	8	53.3	19	56	25.3
B 3042	Ostbote x B 281-81	34	31	91.2	78	92	45.9
B 1268	Katahdin selfed	47	12	25.5	16	198	7.5
B 1274	X 528-170 selfed	27	23	85.2	56	75	42.7
B 1299	Chippewa selfed	19	7	36.8	14	81	14.7
	Family lines, total	282	178	63.1	439	943	31.8
	Breeding material..	193	85	44.0	153	808	15.9
	Checks, Katahdin	37	18	48.6	24	161	13.0
	Checks, Kennebec	37	32	86.5	79	106	42.7

Over 63 percent of the 282 seedlings from the family lines had one or more plants infected with wilt; the 193 breeding stock lots had 44 percent; the 37 Katahdins, 48.6 percent; and the 37 Kennebecs, 86.5 percent. If the entire test is considered on a total-hill basis, then 31.8 percent of the hills in the family lines were diseased; 15.9 of those in the breeding lots; 13 percent of the Katahdins; and 42.7 percent of the Kennebecs.

The family lines are not large in numbers but the reaction of the parents in crosses B 2915, B 1268, B 1274, and B 1299 is certainly interesting. Resistance by inheritance is evident. Many of the parents in the breeding stocks remained free of wilt. It will be necessary to retest all the escapes in 1952.

Breeding Plot

The breeding plot on the Aroostook Farm, Maine, at the present time contains 10-hill rows of 188 seedlings. Each seedling has from one to several desirable factors as a parent. In 1951, it was decided to retest them all, regardless of parentage, for the various potato diseases. It seemed desirable to have a recheck on their known resistant and susceptible factors.

Due to lack of seed, all 188 seedling varieties could not be tested in one year for the seven diseases to be used. But, 188 were used in the scab and late blight tests, 185 in the ring rot tests, 172 in the verticillium wilt tests, 129 in the virus X tests, 111 in the virus A tests, and 98 in the virus Y tests. In 1952, the testing will be continued for resistance to these diseases until all the breeding plot material has been exposed.

Resistance to the common race of late blight in potato seedlings has reached the point where it seems feasible to screen populations for resistance to this disease in the seedling stage. Then, only the resistant ones will be grown to maturity for tuber production and increase for further selection and testing.

This year 7,421 seedlings, representing 20 families, were grown from true seed. As soon as the seedlings were large enough --2 to 4 leaves-- they were inoculated with blight and put through an incubation period. When the typical blight lesions were present they were classified and counted. Only the best-appearing resistant ones were transplanted to 3-inch pots to be grown for tubers. Approximately 70 percent of all the seedlings were considered resistant. From these, 2,977 tubers were produced for further study. The data are presented in Plant Industry table 14.

Plant Industry table 14. Data for family lines that were inoculated with the common race of late blight when the plants were in the seedling stage in the greenhouse on Aroostook Farm, Maine.

Pedigree number	Parentage	Reading 6/15/51			Tubers harvested
		Late blight	Healthy	Total	
		No.	No.	No.	No.
B 3234	Essex x B 505-44	496	267	763	233
B 3235	Essex x B 606-3	164	294	458	253
B 3236	Essex x B 754-16	70	77	147	34
B 3237	Kennebec x Earlaine				3
B 3238	B 355-24 x B 721-1	164	169	333	151
B 3239	B 355-24 x B 919-15	296	570	866	298
B 3240	B 355-24 x B 922-3	120	646	766	264
B 3241	F 431 x B 919-15	55	201	256	110
B 3242	B 505-44 x B 355-24				1
B 3243	B 778-43 x B 922-3	277	140	417	109
B 3244	B 922-3 x B 778-43				4
B 3245	B 922-3 x B 2067-52				3
B 3246	B 922-4 x B 606-3	42	158	200	111
B 3247	B 922-6 x B 919-15				2
B 3248	B 922-6 x B 922-4				36
B 3249	B 922-8 x B 778-43				113
B 3250	B 922-8 x B 919-15				97
B 3251	B 922-12 x B 919-15	94	11	105	19
B 3252	B 922-21 x B 919-15				77
B 3253	B 931-2 x B 922-4	74	146	220	75
B 3254	B 936-12 x B 922-4				4
B 3255	B 2135-28 x B 922-3	83	1,352	1,435	574
B 3256	Aquila x Kennebec	29	122	151	65
B 3257	B 920-7 x B 922-5	1	29	30	24
B 3258	B 922-5 x B 725-37	20	33	53	26
B 3259	B 922-5 x B 920-7				67
B 3260	Acc. No. 25828 x B 922-3	80	280	360	150
B 3261	Acc. No. 25830 x B 919-15	107	0	107	0
B 3262	Acc. No. 25830 x B 922-3	128	18	146	6
B 1351	B 355-24 selfed	14	366	380	9
B 1352	B 922-3 selfed	142	86	228	43
B 1353	B 922-4 selfed				16
A-1	selfed				0
	Total	2,456	4,965	7,421	2,977
	Percent	33.1	66.9	100	

Effect of Sprays on Yield of Certain Potato Varieties

R. V. Akeley, F. J. Stevenson, and P. M. Lombard

The 1951 season was very favorable for late blight in Maine. Rains interfered with spray operations at times when they should have been performed. The results were that fields of susceptible varieties, such as Irish Cobbler and Green Mountain, were killed with blight long before they would have matured normally, and there was an additional loss from blight rot in the tubers.

Under these conditions, Kennebec was grown on a comparatively large acreage without applications of a fungicide. Many reports of blight infection were received, but in the majority of cases these were found to be false. In one or two cases, blight was found, but a close examination showed that the disease occurred on varietal mixtures found in the field. In two fields blight was found on Kennebec late in the growing season. Whether or not this was caused by a more virulent form of the organism has yet to be determined.

Sprays

In 1951 a test to show the value of sprays on a number of potato varieties was conducted on Aroostook Farm, Presque Isle, Maine. These tests gave similar results to those obtained on similar tests in 1949 and 1950.

In 1951 six varieties were included in the test: Katahdin, Sebago, Green Mountain, Cherokee, Pungo, and Kennebec. The last three are immune or near immune from the common races of late blight. The design of the experiment was a split block 4 x 4 latin square. Each sub-plot consisted of 30 hills planted 10 inches apart, and the rows were 34 inches apart. Four treatments were used: bordeaux, bordeaux + DDT, DDT, and no spray. Teton, a blight-susceptible variety, was planted throughout the plot. Three plots of the varieties under test were followed by 2 rows of Teton. The Teton served 2 purposes: It prevented spray drift, and an epidemic of late blight is easily induced on this variety. On July 16 the epidemic was started by placing potted Green Mountain plants that were heavily infected with late blight throughout the plots.

A heavy epidemic was soon prevalent on the Teton rows, which were not sprayed, and on the non-sprayed plots of the susceptible varieties in the test. The various sprays were applied at weekly intervals throughout the growing season --11 times in all. The yield data for this test are given in Plant Industry table 15.

The yields of Katahdin, Sebago, and Green Mountain were highest in the plots sprayed with bordeaux + DDT, but the highest yields produced by the blight-resistant varieties Cherokee, Pungo, and Kennebec were found in the plots sprayed with DDT alone. Kennebec produced a slightly but not significantly higher yield in the non-sprayed plots than in the plots sprayed with bordeaux.

Plant Industry table 15. The effects of sprays on the yields of U. S. No. 1 tubers of six varieties of potatoes grown on Aroostook Farm, Presque Isle, Maine, in 1951

Sprays	Yield of U. S. No. 1 healthy tubers - per acre													
	Katahdin		Sebago		Green Mountain		Cherokee		Pungo		Kennebec		Mean	
	Bu.	Pct.	Bu.	Pct.	Bu.	Pct.	Bu.	Pct.	Bu.	Pct.	Bu.	Pct.	Bu.	Pct.
Bordeaux	516	96	483	95	608	96	623	96	618	98	681	98	588	97
Bordeaux + DDT	556	96	600	96	645	96	640	96	647	98	773	98	644	97
DDT	453	95	423	93	537	96	660	96	655	98	780	98	585	96
No spray	418	94	411	93	495	94	569	95	604	98	693	98	532	95
Mean	486		479		571		623		631		732		587	

L.S.D. at 5-percent level for two varieties with the same treatment - 88.1 bushels

L. S. D. at 5-percent for two treatments on same variety - 99.5 bushels.

From these and similar data obtained in 1949 and 1950, it can be concluded that susceptible varieties produce best when sprayed with bordeaux and DDT, but the resistant varieties, such as Kennebec, need not be sprayed with a fungicide but for best performance they should be sprayed with an insecticide.

Early Harvesting

In 1951 the results of early harvesting were very similar to those for 1950. Eight varieties of potatoes were planted on the Aroostook Farm on May 5. Tops were pulled August 14, August 24, Sept. 4, and all plots were harvested Sept. 25. Data for this test are given in P.I. table 16.

The plots on which the vines were pulled on August 14 yielded at the rate of 406 bushels of U. S. No. 1 potatoes for a mean of the eight varieties; on August 24, 527 bushels; on September 4, 622 bushels; and on September 25, 691 bushels per acre. In the 40 days from August 14 to September 25 there was an increase in yield of 70 percent. It is interesting to note again that Kennebec ranked first in yield in the August 14 harvest date. It yielded 89 bushels more than Irish Cobbler. It should be noted, too, that while none of the varieties was very high in percentage of starch that the starch content increased throughout the 40-day period. In this respect the results differed from those obtained in 1950 when tubers from the first harvest showed the highest specific gravity.

Many of the tubers of the plants that grew until they were harvested on September 25 were large and inclined to be rough. For best market quality the vines of varieties such as Kennebec should be killed in some seasons about 100 days after planting.

Date of Planting

R. V. Akeley, D. Merriam, F. J. Stevenson, and R. Bonde

The date-of-planting test was again repeated in 1951. The data are given in Plant Industry table 17. The same eight varieties and similar planting dates were used. The vines were not killed by frost this season, so most of the varieties grew to maturity.

The average mean yield of 689 bushels of U. S. No. 1 potatoes per acre for the eight varieties on May 5 was the highest for the four dates. The second date of planting ranked second in yield, with the third and fourth dates ranking third and fourth, respectively. For 2 years the second planting date was highest in yield. The difference in 1951 could be due to no killing frosts in September. Usually killing frosts occur around the 10th of September.

There were significant differences between the mean number of U. S. No. 1 tubers per hill for the four dates. These means for the eight varieties had the same ranking as the yields of U. S. No. 1's with May 5 being the highest (5.70 tubers). The percentage of starch also was significant between planting-date means. The May 25 date was highest in starch content, with the means for May 5, May 15, and June 4 following in that order. For the 2 previous years, the highest starch content occurred on the earliest date of planting.

Plant Industry table 16. Yield and percentage of U. S. No. 1 tubers, number of tubers, and starch content of tubers of eight varieties of potatoes planted on the same date on Aroostook Farm, but the tops were pulled at four different dates.

Dates tops pulled and variety	Yield per acre U. S. No. 1 tubers		Mean per hill U. S. No. 1 tubers		Starch
August 14, 1951	Bu.	Pct.	No.	Pct.	Pct.
Mohawk	364	96	3.39	87	12.0
Sebago	341	88	4.39	70	10.3
Katahdin	385	94	4.80	84	12.1
Chippewa	402	91	5.07	76	10.4
Green Mountain	394	93	4.75	81	13.0
Teton	399	92	4.56	79	12.0
Irish Cobbler	438	91	5.76	78	12.2
Kennebec	527	97	4.88	88	12.2
Mean	406	93	4.70	80	11.8
August 24, 1951					
Mohawk	486	97	4.00	88	13.5
Sebago	435	90	4.76	73	12.0
Katahdin	481	95	5.04	85	12.0
Chippewa	493	94	5.27	78	10.3
Green Mountain	618	95	6.39	82	14.0
Teton	535	95	5.49	83	11.8
Irish Cobbler	534	94	6.58	82	12.2
Kennebec	633	97	4.88	89	12.5
Mean	527	95	5.30	83	12.2
September 4, 1951					
Mohawk	600	98	4.53	89	14.2
Sebago	515	91	5.06	74	12.1
Katahdin	606	98	5.44	89	12.5
Chippewa	635	95	5.80	81	10.8
Green Mountain	730	97	6.55	89	14.7
Teton	641	97	5.71	88	11.5
Irish Cobbler	564	93	6.44	80	12.3
Kennebec	684	98	4.97	89	13.0
Mean	622	96	5.56	85	12.7
September 25, 1951					
Mohawk	712	99	4.53	90	15.0
Sebago	617	94	5.98	77	13.0
Katahdin	626	97	5.53	83	12.6
Chippewa	672	95	5.97	80	11.0
Green Mountain	820	97	6.74	86	14.8
Teton	687	96	5.72	85	11.9
Irish Cobbler	599	96	6.68	87	12.2
Kennebec	798	96	5.04	88	13.2
Mean	691	96	5.77	85	13.0

(continued)

Plant Industry table 16, continued.

L.S.D.'s	Yield tubers Bu.	Yield tubers No.	Starch Pct.
Between dates	28.9	0.33	0.02
" variety means	31.7	.36	.02
" varieties harvested same date	63.6	.72	.04
" dates, same or different varieties.	66.0	.75	.04

Plant Industry table 17. Yield of U. S. No. 1 tubers, number of tubers per hill, and percentage of starch of eight varieties of potatoes planted on four different dates on the Aroostook Farm, Presque Isle, Maine, in 1951.

Planting date and variety	Yield per acre U. S. No. 1		Mean per hill U. S. No. 1	Starch content
	Bu.	Pct.	No.	Pct.
May 5, 1951				
Mohawk	673	97	4.62	15.2
Sebago	625	94	5.93	12.9
Katahdin	693	97	5.36	13.4
Chippewa	669	96	5.85	11.3
Green Mountain	811	96	6.72	15.6
Teton	739	98	5.66	12.4
Irish Cobbler	575	94	6.53	12.5
Kennebec	727	98	4.97	13.3
Mean	689		5.70	13.3
May 15, 1951				
Mohawk	660	97	4.38	15.7
Sebago	607	95	5.61	13.5
Katahdin	568	96	4.59	12.5
Chippewa	605	95	5.82	11.3
Green Mountain	671	98	5.18	15.0
Teton	597	97	5.25	12.2
Irish Cobbler	528	93	5.94	12.4
Kennebec	732	97	5.28	13.2
Mean	621		5.25	13.1
May 25, 1951				
Mohawk	546	96	4.15	15.8
Sebago	489	94	4.80	13.0
Katahdin	307	95	4.33	12.7
Chippewa	518	96	5.14	11.0
Green Mountain	654	95	5.84	15.7
Teton	553	96	5.41	13.2
Irish Cobbler	465	91	6.02	13.1
Kennebec	616	97	4.82	14.0
Mean	519		5.06	13.5

(Continued)

Plant Industry table 17, continued

Planting date and variety	Yield per acre U. S. No. 1		Mean per hill U. S. No. 1	Starch content
	Bu.	Pct.	No.	Pct.
June 4, 1951				
Mohawk	405	96	3.49	14.5
Sebago	349	94	3.38	12.7
Katahdin	390	95	4.03	12.9
Chippewa	446	94	4.73	10.5
Green Mountain	543	93	6.11	14.5
Teton	466	94	4.60	12.5
Irish Cobbler	465	95	5.69	12.8
Kennebec	550	96	4.35	13.2
Mean	452		4.55	13.0

	Yield tubers Bu.	Yield tubers No.	Starch Pct.
L.S.D.'s			
Between dates	25.1	0.24	0.05
" variety means	34.4	.31	.18
" varieties harvested same date	68.8	.20	.36
" dates same or different varieties	68.9	.63	.33

Varietal Reaction to Net Necrosis

R. V. Akeley and F. J. Stevenson

Healthy seed of seven varieties or seedlings was included in the tuber-necrosis test this year. Each variety consisted of 20-hill rows replicated 4 times. All plots were planted adjacent to rows of the Katahdin variety, which already had 100 percent chronic leaf roll infection. Viruliferous aphids were transplanted to the leaf-roll Katahdins on July 13 to insure an adequate aphid population. Approximately 3 tubers from each hill were saved and stored at harvesttime. The tubers were examined on January 18, 1952, for internal symptoms. Plant Industry table 18 gives the results of this exposure test.

The Kennebec was free from tuber necrosis, and seedlings B 606-67 and B 355-44 had only one tuber each showing very mild discoloration. The susceptible Green Mountain had over 44 percent of its tubers showing strong symptoms, and the resistant Sebago had only 3.5 percent. Pungo, with 15.8 percent of its tubers netted and Cherokee with 7.7 percent, were both more susceptible than Sebago but far better than the Green Mountain.

Plant Industry table 18. Varietal test for resistance to net necrosis, Presque Isle, Maine, 1951.

Variety or seedling	Tubers stored	Infected tubers	
	No.	No.	Pct.
Kennebec	217	0	00.0
B 606-67	224	1	.4
B 355-44	251	1	.4
Green Mountain	229	101	44.1
Sebago	225	8	3.5
Pungo	215	34	15.8
Cherokee	247	19	7.7

COLORADO (Fort Collins), 1951

Lawrence A. Schaal, United States Department of Agriculture, and
James Gregory, Colorado Agricultural Experiment Station

The potato-breeding and testing program in Colorado was continued as a cooperative effort between the Colorado Agricultural Experiment Station and the U. S. Department of Agriculture. All crosses were made in the greenhouse at Greeley, Colo., by W. C. Edmundson, who also grew and selected all first-year tubers. The five-hill selections were grown in the Greeley plots and selections from these were increased on the U. S.-Colorado Potato Field Station farm at Greeley, Colo. Selections from the five-hill lots were grown in three scab test plots located at Gilcrest, Del Norte, and Woody Greek, Colo. Two increase-test plots were grown; one at Monte Vista, Colo., on the San Luis Valley demonstration farm and one at Eaton, Colo. in the northern Colorado potato district. These two plots will be maintained for the testing of seedling selections and named varieties for adaptability and also for disease-resistance observation.

Practically all seedling lots produced at the Greeley Station came from parent material of which one or both were resistant to scab. The demand for a variety to replace Bliss Triumph continues and considerable effort has been given to the production of scab-resistant red varieties.

Most of the lots grown in the Monte Vista plot and in the Eaton Plot were selected from the Nebraska lots obtained from H. O. Werner in 1949. Several of these selections showed considerable promise in the Monte Vista test in 1950. Of the Colorado seedlings, one, 6362, was outstanding and continues to hold up as a scab-resistant, quality selection.

Three scab test plots were grown in Colorado in 1951. They were located in (1) the early-crop area near Gilcrest, (2) in the San Luis Valley at Del Norte, Colorado, and (3) at Woody Creek, Colo., in a high mountain valley.

Each of these potato-growing areas has a scab problem that varies from year to year. The scab plots were grown in soil that normally produces quite scabby potatoes. Infection was not heavy in the Del Norte and Gilcrest plots, but sufficient infection occurred to permit a quite reliable scab reading. There was some variation in the resistance of a given selection when grown in the three plots. Several Nebraska selections were grown in the Del Norte plot, but all were quite susceptible to scab. Several seedling selections were scab-resistant and showed considerable promise in one or all of these three plots. These seedling selections are listed in Schaal table 1. Only six showed scab resistance and other desirable characters in all test plots. The Woody Creek test is a severe one, and few varieties have been found that show high resistance to the particular race found in that plot.

Gilcrest, Colo., Test Plot, 1951

Under normal growing conditions the soil in this plot is heavily infested with several virulent races of scab. In August 1951, 6 inches of rain fell in 24 hours, and scab infection was not as severe as usual. Sufficient infection was present for a good reading of pustule type. Sixty-five seedling selections and five named varieties were grown in this plot. Observations were made on vine type, size of vine, maturity, tuber type and yield, and scab resistance. General observations on late- and early-blight resistance were also noted.

Of the 65 seedling selections tested, 12 showed scab resistance and general adaptability to be better than the two commonly grown commercial varieties, Russet Burbank and Bliss Triumph, grown in the field. A source of clean seed of these seedling selections was maintained at the Greeley Station, and further testing and increase of these lots will be made in 1952. Schaal table 1 lists the seedling selections considered of value for further testing.

Woody Creek, Colo., Test Plot, 1951

The Woody Creek soil is the most heavily infected soil found in Colorado. It continues to be the most severe test of scab resistance yet found. There apparently are but a few virulent races of Streptomyces scabies present in this soil but in large quantities. Susceptible varieties like Bliss Triumph, Irish Cobbler, and Red McClure cannot be grwon in this soil. Ninety percent coverage with No. 3 and No. 4 type pustules is common. Russet Burbank is the most resistant variety found to date and is grown commercially to some extent. C.S. 7846, with 3-type pustules in some areas, is quite free from scab, and with a No. 2 type pustule the most severe yet found. C.S. 10185, a Russet seedling variety, is also resistant. A red seedling, C.S. 10585, was free of deep scab, and N.D. 515-2 showed very light infection with a 2-type pustule, the most severe noted. C.S. 6362 showed some resistance with a 2-type pustule but with a heavy coverage. Several other seedlings showed considerable resistance in this test plot (Schaal table 1).

Del Norte, Colo., Test Plot, 1951

This test plot was located on the Falk farm near Del Norte in the Rio Grand River Valley. Certain areas in this valley have severe scab, whereas the San Luis Valley in general is quite free from serious scab infection. The particular race present in this soil is very virulent on most susceptible varieties. Seventy-three seedling selections and five named varieties were grown in this plot. Several appeared to grow as well as, or better than, Red McClure, the standard variety(Schaal table 1), and were free from deep scab. An extremely variable water supply during the 1951 season presented a good test of adaptability. N.D. 515-2 again appeared to grow well and to be quite free from deep scab. C.S. 6362 and Yampa produced the best yield and were free from scab. All six of the Nebraska selections tested were quite susceptible to scab.

Schaal table 1. Seedlings appearing to have promise at one or more of the following places, 1951.

Seedling number	Gilcrest Colorado	Del Norte Colorado	Woody Creek Colorado	Parentage
C.S 7846	+	+	+	C.S. 3245 x U.S. 627-164
C.S. 10185	No test	+	+	C.S. 2995 x U.S. 627-164
C.S. 10213	+	+	+	C.S. 1119 x U.S. 627-164
C.S. 10513	+	-	-	President x Yampa
C.S. 10522	+	-	No test	C.S. 3088 x U.S. 245-186
C.S. 10540	+	+	-	C.S. 5218 x U.S. 245-186
C.S. 10548	+	-	-	C.S. 5218 x U.S. 245-186
C.S. 10568	+	-	-	C.S. 5218 x B 400
C.S. 10583	-	No test	+	R. Jubel x C.S. 6079
C.S. 10585	+	+	+	C.S. 5218 x C.S. 8859
C.S. 10592	+	+	-	C.S. 5218 x C.S. 8859
C.S. 10615	-	+	-	C.S. 1485 x R. Jubel
C.S. 10629	+	+	+	Katahdin x U.S. 245-186
C.S. 10648	-	+	-	C.S. 7990 x C.S. 7702
C.S. 10672	+	+	+	Yampa x C.S. 1119
C.S. 10760	+	No test	No test	Houma x Yampa
B 515-2	No test	+	+	Russet Burbank x (X96-56)
C.S. 6362	+	+	+	Katahdin x Menominee

+ = Scab-resistant and horticulturally desirable.
- = Not scab resistant and/or not horticulturally desirable.

The Weld County Adaptability and Increase Plot, 1951

This plot was grown on a farm located in the northern Colorado potato-growing district near Eaton, Colo. The land rental and certain other expenses were furnished by potato growers of this district. The selections grown represent the most promising lots grown in 1950 in the Monte Vista plot in the San Luis Valley. These varieties and selections, the same ones grown in the Monte Vista plot for the most part, were selections from Nebraska and Colorado. Several of the red selections had shown promise in 1950 in the San Luis Valley. This plot was rogued several times during the season and examined several times by a committee representing the potato growers of this section. Their needs and desires were given careful attention in selecting those lots for further testing. Type of plant, size of plant, tuber type and yield were considered. Fifteen seedling selections were considered promising and will be grown in larger lots in the northern Colorado potato district in 1952 (Schaal table 2).

Schaal table 2. Weld County test plot. Eaton, Colo. 1951. Varieties selected for test in 1952.

Variety or seedling	Tuber color	Tuber type	Tuber shape
White Cloud	White	Round	Irregular
Neb. 25-42-2	Red	Round	Irregular
Neb. 225-43-1	Deep red	Round	Irregular
Neb. 38-42-3	Red	Round	Regular
Neb. 717-43-1	Deep red	Round	Regular
Neb. 311-43-1	Deep red	Round, flat	Irregular
Neb. 213-43-2	Red	Round	Regular
Neb. 213-43-3	Red	Oval round	Regular
Neb. 204-43-1	Deep red	Oval, round	Regular
Neb. 209-43-1	Deep red	Oval, Round	Regular
Neb. 140-42-1	White	Oval	Regular
Neb. 120-42-6	White	Round, flat	Irregular

All of the varieties and selections grown in this test were also grown in the U. S. Potato Station plots located in this same general area.

With one exception Neb. 38-42-3, which produced a large plant, the plant sizes of the selections made were all medium. The eyes of the tubers were shallow or medium shallow and no knobs or growth cracks were observed, although a number of other varieties were discarded because of these defects. W. C. Edmundson's report gives yield data, and also the specific gravity of these various selections.

The Monte Vista Adaptability and Increase Plot, 1951

The Monte Vista plot was not designed as a disease test plot, but rather an increase and adaptability test. All seedling and new variety material that had shown promise in the several disease plots and at the Greeley Station were grown here for observation as to adaptability as expressed in type of plant, tuber type, yield, and disease expression. The seed from which these lots were planted had been indexed in the greenhouse and grown on the same farm in 1950 when it was heavily rogued to eliminate virus diseases so far as was possible. A great part of this plot was made up of seedling selections from H. O. Werner of the Nebraska Agricultural Experiment Station. Most of these Nebraska selections were red, since the interest of this section is to obtain a good red tuber variety, preferably earlier maturing than the Red McClure and more adapted to growing than the Bliss Triumph variety. Fourteen seedling selections and one named variety (Schaal table 3) were considered to have sufficient promise to warrant further testing in the San Luis Valley. These will be planted in larger lots in 1952.

Schaal table 3. San Luis Valley test plot. Monte Vista, Colorado, 1951. Varieties selected for test in 1952.

Variety or seedling	Tuber color	Tuber type	Desirability
N. 25-42-2	Red	Round	Small tubers
N. 225-43-1	Deep red	Round	Early maturing
N. 38-42-3	Red	Round	Large tubers
N. 217-43-1	Deep red	Round	Large tubers
N. 311-43-1	Deep red	Round	Tubers flat
N. 213-43-2	Red	Round	Tubers small
N. 213-43-3	Red	Oval round	Tubers small
N.204-43-1	Deep red	Oval round	Slight russeting
N.209-43-1	Deep red	Oval round	
N. 140-42-1	White	Oval	Good yield
N. 120-42-6	White	Round flat	Good yield

The tubers of the selections made had shallow to medium-shallow eyes. A few produced irregular-shaped tubers. They were all free from knobs and growth cracks with the exception of Neb. 38-42-3.

The specific gravity and starch content of a number of named and numbered varieties grown in Weld County and in the San Luis Valley are given in Schaal table 4.

Schaal table 4. Specific Gravity and starch content of seedling and varieties. 1951.

Number or variety	Weld County		San Luis Valley	
	Specific gravity	Starch	Specific gravity	Starch
		Pct.		Pct.
N. 120-40-6	1.077	13.2	1.082	14.4
Bliss Triumph	1.065	10.7		
N. 217-43-1	1.076	13.1	1.080	13.9
Ia. 736-42	1.075	12.9	1.081	14.2
Pontiac	1.066	10.9		
N. 204-43-1	1.074	12.6	1.077	13.2
N. 38.42-3	1.077	13.2		
C.S. 6362	1.078	13.4	1.087	15.4
Burbank	1.071	11.9		
N. 140-42-1	1.071	11.9	1.079	13.7
N. 225-43-1	1.079	13.7		
White Cloud	1.075	12.9		
N. 209-43-1	1.073	12.4		
N. 213-43-2	1.075	12.9	1.082	14.4
N. 311-43-1	1.083	14.6	1.091	16.2
Katahdin	1.067	11.1		
Wyo. 4700	1.078	13.4	1.078	13.4
N. 25-42-2	1.072	12.2	1.079	13.7
N. 213-43-3	1.074	12.6	1.085	14.9
N. 60-44-1			1.073	12.4
Kennebec			1.085	14.9

INTER-REGIONAL POTATO INTRODUCTION AND PRESERVATION STATION

R. W. Hougas

Particular emphasis has been placed upon the early introduction of additional foreign varieties, species, species hybrids, and other breeding stocks of value to potato workers of the United States. As a guide to this program, the potato workers have been encouraged to request specific foreign stocks, or stocks possessing certain desired characters, which are not currently available in this country. Following this procedure, a considerable portion of the more valuable stocks of the large Commonwealth Potato Collection were introduced this year and additional stocks have been requested.

The current potato collection of the Introduction Station is comprised of 1,336 clones and 347 seed stocks, which includes:

a. 74 foreign and domestic varieties

b. 117 unnamed breeding stocks of S. tuberosum of domestic and foreign origin

c. The following Solanum species: acaule, ajuscoense, andigenum, Antipoviczii, Boergeri, boreale, bulbocastanum, cardiophyllum, chacoense, Commersonii, curtilobum, demissum, dolichostigma, Emmeae, Fendleri, Garciae, gibberulosum, gigantophyllum, Jamseii, jujuyense, lanciforme, leptostigma, longiconicum, longipedicellatum, Macolae, malinchense, Parodii, phureja, pinnatisectum, polyadenium, Rybinii, saltense, sambucinum, Santolallae, Schickii, semidemissum, simplicifolum, stoloniferum, tarijense, tlaxcalense, toralapanum and verrucosum.

d. 157 species hybrids, largely of foreign origin.

The species listed above comprise about one-fifth of the known tuber-bearing Solanums. The collection is being enlarged as rapidly as feasible to include the full range within the genus. Since the variation within a species has been clearly demonstrated to be as important as the variation between species (insofar as resistance to insects and disease and other economically important characteristics) the policy has been established of obtaining, where possible, several different selections of each species.

Shipments of seeds and tubers have been made to 19 States and 5 foreign countries. The reports concerned with the evaluation and use of the stocks distributed, which have been submitted to the Potato Introduction Station by the various technical workers of this country and abroad, have been encouraging. Evaluation reports have been received during the past year from the States and countries listed below. The details of these reports (technical data, station, workers, etc.) are listed in the 1951-52 Solanum inventory.

State or Country Reporting	Evaluations on:
Idaho	Resistance to curley top & verticillum wilt
Louisiana	Horticultural characteristics
Michigan	Resistance to scab & fusarium
Minnesota	Resistance to late blight, scab & frost; fertility; species crossability; specific gravity; horticultural characteristics
Nebraska	Resistance to scab; horticultural characteristics
North Carolina	Resistance to southern bacterial-wilt
South Dakota	Resistance to scab & early blight; horticultural characteristics
Virginia	Horticultural characteristics
West Virginia	Resistance to late blight
Wisconsin	Resistance to scab & Y-virus; cytological investigations; horticultural characteristics
Wyoming	Resistance to ring rot; yield
Division of Plant Exploration & Introduction	Taxonomic classification
Germany	Resistance to late blight, early blight, and viruses X, Y and leaf roll

The enlargement of the potato collection has been deliberately slow, until very recently, in order that adequate and suitable facilities were available to care for and ensure against loss of the introduced stocks. Of the several thousands of potatoes introduced into this country, prior to the present preservation program, only a very few are currently available. These stocks were lost because the task of maintenance and preservation was too great for the individual technical worker engaged in his own research. Many stocks were lost before they could be initially evaluated. This is clearly understandable in that the majority of the wild species cannot be maintained without considerable care in addition to that required in the propagation and preservation of our cultivated potato. Undoubtedly the primary factor contributing to failure in the preservation of these stocks is the short-day-length required for tuberization of many species. The experience of the technical workers of this country and Europe has demonstrated that the most effective and efficient method of maintaining such stocks is propagation under glass.

Now that most of the essential physical plant (greenhouse, tuber and seed storage, etc.) is nearing completion the potato collection can be rapidly expanded to include:

1. The numerous valuable foreign breeding stocks described in the literature.

2. The wide range of tuber-bearing species now known in the genus Solanum.

3. New introductions of the indigenous potatoes of South and Central America and Mexico.

This expansion program is now under way and will be continued in cooperation with the Division of Plant Exploration and Introduction.

An inventory of the available tuber and seed stocks has been prepared and will be distributed to the technical workers interested in the breeding and improvement of potatoes, as well as to the various investigators interested in botanical studies of the genus Solanum. This inventory summarizes the evaluation data, submitted by the various workers of this country and abroad, concerning the introductions being maintained and distributed by the Potato Introduction Program.

Dr. Donovan S. Correll of the Division of Plant Exploration and Introduction has completed a revision and monographic treatment of the approximately 50 species of wild potatoes and their near relatives known to occur in North America and Central America. This is now in press and will be issued as a U.S.D.A. Agricultural Monograph.

Technical Committee

The Technical Committee of the Inter-regional Potato Introduction and Preservation Project has been recently appointed by the administrators of the Bureau of Plant Industry, Soils, and Agricultural Engineering, USDA, and by the directors of the State agricultural experiment stations. This Committee will meet at least once each year to formulate plans for research, to prepare an annual budget, and to make an annual report of progress. Recommendations will be made by the Technical Committee to the National Coordinating Committee and to the Committee of Nine on matters of policy and budget, respectively.

The members of the Technical Committee are:

F. J. Stevenson, Division of Vegetable Crops & Diseases, BPISAE, USDA
C. O. Erlanson, Division of Plant Exploration and Introduction, BPISAE, USDA
F. D. Cochran, North Carolina State Agricultural Experiment Station
F. A. Krantz, Minnesota Agricultural Experiment Station
W. R. Mills, Pennsylvania State Agricultural Experiment Station
C. L. Vincent, Washington State Agricultural Experiment Station
R. W. Hougas, Division of Plant Exploration and Introduction, BPISAE, USDA & Wisconsin Agricultural Experiment Station

The administrative adviser for the Project is:

Dean W. V. Lambert, Nebraska Agricultural Experiment Station.

NORTH CENTRAL REGIONAL POTATO TRIALS 1951

By C. E. Peterson and Cooperators

(See Table of Contents)

A cooperative potato-testing program for the North-Central region was initiated in 1951. According to plans formulated by the regional potato breeders committee, each cooperating State may enter 3 selections or new varieties for replicated trials and 10 selections for observation trials. In the 1951 trials, 17 selections and new varieties and 3 check varieties were included. Reports were received from all locations except Iowa where the plots were destroyed by floods. Peterson table 1 lists pertinent general data on plots at each of the locations.

Standard procedures with regard to experimental design and method of reporting observations and data were established by agreement of the members of the committee.

Because of extreme variability in stands experienced at all locations it was necessary to adjust yields for stand differences by means of covariance analysis.1/ Such yield estimates are admittedly far from satisfactory but any analysis based on unadjusted yields would have been meaningless. An effort was made to pool yield data from different locations but this was impossible because the variances were not homogeneous. It was found, however, that variances from Nebraska and Wisconsin were sufficiently homogeneous to permit a pooled analysis for these two locations. When this was done it was discovered that no significant differences occurred between variety means averaged over the two locations, and the variety x location interaction was highly significant. This type of analysis, if more locations could be included, would provide a means of determining conditions under which each variety will give its best response and would help determine how widely the varieties are adapted.

The data from Nebraska (Peterson table 2) show no entry significantly exceeding Triumph in total yield but several produced a higher percentage of U.S. #1 potatoes. Wisconsin 303-40 (entry No. 7) produced a yield not significantly below Triumph, and the percentage of No. 1 potatoes was 79.9 compared with 64.8 for Triumph. Most varieties in the Nebraska trial had rather heavy losses from tuber rot due to late blight. Two of the most severely damaged were Nebraska 213.43-2 and Minnesota 101.44-9-46 with losses of 40% and 28%, respectively. No late blight tuber rot was observed in Wisconsin 303-40 or Cherokee in Nebraska. Entries most severely affected by second growth and growth cracks in Nebraska were Cobbler 31%; Michigan 125-4, 30%; B 515-2, 31% and Cherokee, 29%.

1/ The statistical laboratory at Iowa State College analyzed the data. The cooperation of Dr. T. A. Bancroft and Mr. D. W. Gaylor is gratefully acknowledged.

Peterson table 1. North Central Regional Potato Trials 1951.

	Nebraska	North Dakota	Wisconsin	Michigan	Minnesota
Cooperator	H. O. Werner	J. H. Schultz	G. H. Rieman	E. J. Wheeler	F. A. Krantz
Location	Scottsbluff	Grand Forks	Antigo	Lake City	Duluth
Soil Type	Tripp very fine sandy loam	Bearden Clayloam	Antigo silt loam	Light, sandy loam	Clay loam
Fertilizer	P 40#/A N 40#/A	800# 8-24-12	1000#/A 3-9-18	600# 3-12-12	100# 0-20-20
Date planted	June 15	May 27	June 6	May 22	May 28
Date harvested	October 5	October 14	October 1	Sept. 24	Sept.
Spacing	36" x 12"	42" x 18"	36" x 12"	36" x 12"	36" x 18"
Remarks	Irrigated weekly 7/25-9/5. Late blight epidemic	Drought conditions until July 29, frost Sept. 23. No fungicide treatment. No late blight observed.	Trace of late blight on vines & tubers. 7-day spray schedule.	No serious disease problem	Dry to Aug. 20 L.B. severe on vines & tubers.

In the Wisconsin plots, on the basis of appearance, Katahdin was noted as outstanding among the white varieties. Entry No. 13 (Neb. 213.43-2) and Progress were considered outstanding as red varieties. Except for 5% growth cracks observed in B 515-2 there were no marked tendencies toward any particular grade defects in the different entries grown in Antigo, Wis.

Selection B 515-2 developed approximately 10% growth cracks and 3% second growth in the trials at Grand Forks, N. Dak. None of the new selections or varieties yielded significantly higher than either Triumph or Cobbler in these plots.

At Duluth, Minn., none of the entries exceeded the yield of Triumph by a significant margin. The most serious grade defect observed was in a sample of 6316 (entry 19), which had 40% hollow heart.

Katahdin, the check variety at Lake City, Mich., produced the lowest yield at that location. This variety also made a rather poor showing in Wisconsin, North Dakota, and Minnesota, yielding significantly below Triumph at all three locations. In Nebraska, Katahdin yield was lower that that of Triumph but the difference is not significant.

Extra copies of the complete data and notes taken at each location were prepared for all the States engaged in this trial. These notes included estimates of grade defects and other details not included in this summary and will provide each cooperator with a means of carefully evaluating performance of selections and varieties in which he is particularly interested.

Peterson table 3 lists starch percentage data for all five locations. Because of high variability between samples, the Minnesota data could not be included in the pooled analysis. Data from Nebraska, North Dakota, and Wisconsin satisfied the requirements of homogeneity of variances and could be pooled. Michigan data could not be included in the pooled anaylsis because all the varieties were not represented at that location. Minnesota and Michigan data were analyzed separately and are included in Peterson table 3.

The greatest difficulty in the 1951 trials was that of securing uniform stands at all locations. This might be improved by distributing seed in the spring rather than in the fall. Part of the stand failures may be due to varietal weakness but in this case it is likely that certain of the seed lots were damaged in transit.

It is hoped that the experience gained in 1951 will serve to improve the program in subsequent years. The cooperation of all members of the committee who participated in these trials was excellent. Certain refinements such as standardizing plot size and increasing number of samples for specific gravity determinations may be needed.

Plans are to repeat these regional trials in 1952 following essentially the same procedure. Indiana and Kansas will participate in 1952 making a total of eight locations.

Peterson table 2. North-central regional trials, 1951. Performance of selections and varieties at five locations.

Variety and seedlings	Nebraska			Wisconsin			North Dakota			Minnesota			Michigan		
	1/	2/	3/	1/	4/	5/	1/	4/	3/	1/	4/	3/	1/	4/	6/
	Yield per A	U.S. No. 1	Mat.	Yield per A	U.S. No.1	Mat.	Yield per A	U.S. No. 1	Mat.	Yield per A	U.S. No.1	Mat.	Yield per A	U.S. No. 1	Mat.
	Bu.	Pct.		Bu.	Pct.		Bu.	Pct.		Bu.	Pct.		Bu.	Pct.	
Cobbler	304	44.1	1.5	613	93.2	2	232	96.1	2.0	95	77.1	1.5	--	--	--
Katahdin	361	79.5	3.7	505	94.2	4	135	85.0	4.0	120	70.5	2.2	121	58.1	L
Triumph	435	64.8	1.5	601	94.5	4	262	95.5	2.0	176	81.5	2.5	--	--	--
Min. 101.44-9-46	100	43.6	1.5	162	96.0	3	103	92.6	1.0	52	81.2	1.0	--	--	--
Min. 147.44-17-46	425	64.5	2.7	507	95.7	4	190	97.1	3.0	129	85.0	3.0	232	72.4	VE
Min. 23	102	58.4	2.0	329	95.7	3	183	97.0	2.2	89	88.4	1.4	167	75.5	VE
Wis. 303-40	345	79.9	4.0	518	92.5	4 +	236	95.5	4.0	200	78.6	5.0	351	66.4	M
Wis. K5	403	65.7	3.2	622	95.2	3	210	96.2	3.0	196	84.6	2.0	269	64.1	ME
Wis. M304	238	60.9	3.7	548	95.7	4	241	94.1	4.2	200	84.4	3.9	162	71.1	M
Mich. 125-4	212	51.6	3.3	450	95.5	4	235	95.3	3.2	118	87.2	2.5	203	88.7	E
Mich. 1363	386	66.9	1.2	570	96.0	3	206	97.0	1.8	151	87.1	1.2	123	73.8	E
Mich. 46-2	310	69.1	2.7	482	93.2	4	91	80.1	2.8	106	76.5	2.5	230	62.9	ML
Neb. 213-43.2	387	44.5	2.7	625	93.7	3	247	94.6	2.2	186	73.8	2.1	288	59.6	M
Neb. Progress	296	74.2	2.7	610	89.7	3	248	92.0	1.8	149	79.4	1.9	213	40.8	E
Neb. White Cloud	404	72.4	1.5	531	90.2	3	197	95.7	1.8	121	71.7	1.3	220	49.2	E
N.D. B 515-2	339	62.6	1.2	580	90.5	4	230	68.3	1.5	162	84.7	1.4	237	62.0	ME
N.D. 457	257	78.1	2.2	462	96.0	4 +	256	95.8	4.0	141	80.6	2.3	174	65.8	L
Cherokee	304	54.1	2.7	590	95.0	4	261	97.9	3.2	177	83.1	5.0	--	--	L
Ia. 6316	305	68.3	2.7	475	97.2	4 +	201	92.4	3.2	157	90.1	3.0	--	--	M
Ia. 44-16-1	256	78.8	4.0	486	92.5	4 +	230	92.0	4.8	178	66.3	4.0	206	74.8	L
L.S.D.	102			73			44			47			59		

Least significant differences should be used only for making comparisons with check varieties, 1, 2 or 3.

1/ All yields adjusted for stand differences by covariance analysis.

2/ Based on composite sample of 4 replications.

3/ Maturity notes are means of 4 replications, values 1 to 4, with class 2 corresponding to Cobbler maturity and class 4 corresponding to Katahdin maturity.

4/ Mean of separate determinations for each of 4 replications.

5/ Maturity notes for one replication

6/ VE, very early; E, early; ME, medium early; ML, medium late; L, late.

Peterson table 3. North-central potato trials 1951. Starch percentage of varieties and selections grown in five States. Calculated from specific gravity data.

Variety or seedling	Nebraska	North Dakota	Wisconsin	Mean for 3 locations	Michigan	Minnesota
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Cobbler	13.0 1/	13.2	12.4	12.8	--	14.3
Katahdin	11.5	10.9	12.1	11.5	14.3	11.7
Triumph	12.1	11.7	11.1	11.7	--	12.1
Min. 101.44-9-46	10.4	11.3	12.1	11.3	--	13.0
Min. 147.44-17-46	10.0	9.8	10.2	10.0	11.3	13.9
Min. 23	11.7	11.3	11.1	11.3	10.9	14.1
Wis. 303-40	12.6	10.2	11.1	11.3	15.1	12.1
Wis. K5	10.6	11.3	10.4	10.9	11.7	11.9
Wis. M 304	14.3	13.2	13.0	13.6	15.1	14.3
Mich. 125-4	10.4	11.1	10.6	10.9	12.4	12.4
Mich. 1363	11.9	11.5	10.6	11.3	11.9	14.1
Mich. 46-2	10.9	10.0	10.6	10.4	11.3	9.8
Neb. 213-43-2	13.0	12.4	10.9	12.1	14.5	14.3
Neb. Progress	11.9	11.9	11.1	11.7	13.6	11.5
Neb. White Cloud	12.4	13.0	12.6	12.6	14.1	14.7
N.D. B 515-2	10.4	10.9	11.7	11.1	11.9	12.1
N.D. 457	13.2	13.4	13.2	13.2	14.3	17.1
Ia. Cherokee	12.6	13.9	12.1	13.0	--	14.3
Ia. 6316	14.9	13.0	12.8	13.6	--	15.6
Ia. 44-16-1	12.1	11.7	11.1	11.7	13.0	12.6
L.S.D.	1.3	1.1	0.6	0.6	0.9	N.S.

1/ Mean of two samples of approximately 20 tubers.

PACIFIC NORTHWEST

John G. McLean

Intermediate Districts

In the trial at Lewiston, Idaho, Kennebec significantly outyielded all varieties except Pontiac (Idaho table 1). It is possible that Kennebec could be grown to an advantage in this area where there is a small local acerage of Chippewa at the present time.

Idaho table 1. Yield and quality of 15 varieties at Lewiston. 1/
Woodbury and McLean

Variety	Yield	U.S. No. 1	Specific gravity	Dry 1/ matter	Starch 1/
	sx/A.	Pct.		Pct.	Pct.
Kennebec	343.2	74.6	1.085	20.8	15.1
D. R. Pontiac	304.7	89.0	1.078	19.4	13.6
De Soto	296.9	82.8	1.084	20.4	14.9
N.D. 179-25	270.6	84.5	1.085	20.8	15.1
C.S. 6330	266.7	88.0	1.086	20.9	15.2
Chippewa	256.2	86.7	1.082	20.2	14.4
White Rose	248.0	69.2	1.088	21.4	15.7
Russet Burbank (8)	235.4	69.4	---	--	--
Menominee	233.2	82.8	1.071	17.7	11.9
Red Warba	218.9	80.0	1.085	20.8	15.1
Progress	212.8	76.4	1.078	19.4	13.6
Yampa	212.5	93.0	1.065	16.5	10.7
1276-185	206.0	89.5	1.074	18.4	12.7
B 515-2	191.4	66.2	1.075	18.7	12.9
Triumph	183.3	90.0	1.078	19.4	13.6
L.S.D. at 19:1	44.4	12.1			

1/ Results of 5 replications.
2/ From Macker, Morgan and Foth.

The variety trial at Parma, Idaho, was of little value since it was necessary to plant in hard rather dry ground, which could not be irrigated in sufficient time. The poor stands and uneven emergence that resulted, rendered the yield data practically worthless (Idaho table 2). It did, however, tend to exaggerate the defects of the varieties. Varieties that produced a high percentage of U. S. No. 1's under these conditions could be readily grown in the area. Examples of the smoother varieties would be Kennebec, B 515-2, and N.D. 179-23, which produced more No. 1's per acre, respectively, than did the standard varieties White Rose, Russet Burbank, Triumph, or Pontiac.

Idaho table 2. Yield and quality of 13 varieties at Parma. 1/
Franklin, Bullard, McLean

Variety	Yield per A	U.S. No.1	Specific gravity	Dry matter 2/	Starch 2/	Major defects
	Sacks	Pct.		Pct.	Pct.	
White Rose	231.5	60	1.083	20.4	14.7	Rough
Cobbler	220.1	87	1.093	22.5	16.7	10% small
N.D. 179-25	206.2	92	1.081	19.9	14.2	15% small
D.R. Pontiac	203.2	60	1.077	19.0	13.3	Rough
Kennebec	198.1	85	1.084	20.5	15.0	8% small
Triumph	180.9	92	1.083	20.4	14.7	4% small
B 515-2	177.4	90	1.083	20.4	14.7	Growth cracks
Menominee	175.4	70	1.080	19.7	14.0	Heat sprouts
1276-185	171.9	80	1.078	19.4	13.6	10% small
Russet Burbank	169.6	45	1.089	21.6	15.9	Rough - 30% small
Cayuga	168.1	10	1.088	21.4	15.6	90% small
Progress	154.2	62	1.078	19.4	13.6	30% small
Yampa	88.3	20	1.074	18.4	12.7	Growth cracks
L.S.D. at 19:1	44.1	18.2	.006			

1/ Results of 5 replications. 2/ From Macker, Morgan, and Foth

From a field test of Kennebec, in the Parma area, a grower produced 300 to 325 sacks of U. S. No. 1's per acre on the entire field. A test lot on this field showed 80 sacks of U. S. No. 1. grade to 2 sacks under size. When these potatoes reached the market, however, the price was 50 to 75 cents below that of White Rose, due to the competition of round white potatoes from the Midwest. Such conditions will make the introduction of new varieties somewhat difficult.

Late Districts

The dry variety trial at Tetonia (Idaho table 3) seems to indicate that production of seed potatoes would be possible on the varieties tested.

Idaho table 3. Yield and quality of 5 varieties on dry land at Tetonia. 1/
McKay and McLean

Variety	Yield per acre	U. S. No. 1	Specific gravity	Dry matter 2/	Starch 2/
	Sacks	Pct.		Pct.	Pct.
N.S. 179-25	98.2	77.5	1.063	16.0	10.2
White Rose	86.9	76.3	1.049	13.9	7.2
Kennebec	83.9	87.5	1.057	15.1	9.1
Russet Burbank	75.8	45.0	1.060	15.5	9.7
Menominee	70.2	67.5	1.053	14.7	7.7
B 515-2	51.3	63.8	1.059	15.4	9.5
L.S.D. at 19:1	18.2	10.9	.005		

1/ Results of 4 replications. 2/ From Macker, Morgan, and Foth

The trial on the Egin Bench where verticillium infection is serious (Idaho table 4) proved to be similar to the previous trials in regard to verticillium infection. Excess rainfall and cool weather in the latter part of the season delayed the increase of severity of the disease, as well as the maturity of the later varieties. As a result, there was very little correlation between yield and verticillium.

Idaho table 4. Yield, verticillium, and quality of 10 varieties on Egin Bench. 1/ McLean

Variety	Yield	Verticillium ave. index	U. S. No.1	Specific gravity	Dry 2/ matter	Starch 2/
	sx/A		Pct.		Pct.	Pct.
Sequoia	243.2	1.6	62.5	1.066	16.7	11.0
Craigs Bounty	236.0	7.3	72.5	1.075	17.0	11.2
White Rose	234.2	58.7	45.0	1.054	14.9	8.0
Cayuga	206.9	21.7	60.0	1.078	19.4	13.7
AC 25671	201.5	22.5	78.8	1.067	16.9	11.2
Menominee	185.3	18.3	71.3	1.071	17.7	12.0
AC 25669	168.9	0.8	65.0	1.065	16.5	10.7
Saranac	145.2	2.7	73.8	1.064	16.2	10.5
Populair	127.1	1.2	13.8	1.091	22.1	16.4
Russet Burbank	125.3	61.9	60.0	1.062	15.8	10.0
L.S.D. at 19:1	87.8		32.6	.008		

1/ Results of 5 replications.

2/ From Macker, Morgan, and Foth.

Hot, dry, weather in August in the Upper Snake River Valley, followed by rains and cool weather, resulted in a rough crop of Russet Burbank potatoes. In the variety trial at Aberdeen, (Idaho table 5) the Russet Burbank variety produced 94.8 sacks per acre of U. S. No. 1 tubers. This yield was exceeded by Menominee with 284.4; C.S. 6330 with 227.5; Cayuga with 225.2; and B 515-2 with 157.6 sacks per acre of U. S. No. 1's.

Idaho table 5. Yield, verticillium and quality of 10 varieties at Aberdeen. 1/ Sparks and McLean

Variety	Yield	Verticillium ave. index	U. S. No. 1	Scab	Specific gravity	Dry 2/ matter	Starch2/
	sx/A.		Pct.	Pct.		Pct.	Pct.
Menominee	326.5	0.6	87.4	0.4	1.084	20.6	14.9
Gr. Mountain	326.2	7.6	42.9	38.3	1.103	24.7	19.0
N D 179-25	300.6	25.1	49.9	25.4	1.071	17.7	17.9
White Rose	287.3	20.7	33.0	29.1	1.073	18.2	12.4
C S 6330	267.3	12.6	85.5	1.0	1.078	16.2	13.7
B 515-2	256.2	21.4	65.0	0.0	1.064	16.2	10.5
Cayuga	255.9	2.6	88.1	0.5	1.089	21.6	15.9
Mohawk	233.8	5.2	29.2	41.8	1.083	20.3	14.5
Russet Burbank	231.8	19.8	41.0	1.0	1.079	19.6	13.9
Progress	151.3	39.1	46.5	22.3	1.068	17.2	11.4
L.S.D. at 19:1	73.9		12.8		.015		

1/ Results of 5 replications
2/ From Macker, Morgan, and Foth

Scab

In Idaho table 6 is shown a summary of the scab readings at Aberdeen, Idaho. Some commercial fields of Russet Burbank were badly infected in this area, and 30 to 70 percent of the tubers were discarded because of scab. Type 3 to type 5 lesions were produced on Menominee, Cayuga, and Ontario. From Idaho table 5 it can be seen that Menominee, C.S. 6330, Russet Burbank, B 515-2, and Cayuga were sufficiently resistant to show 1 percent or less of scabby tubers by weight.

Idaho table 6. Scab at Aberdeen. McLean

	Scab	1 type	2 or 3 type	above 3
	No.			
Varieties	10	1	4	25
Seedlings	76	16	92	127

Specific Gravity

There was little difference among varieties on specific gravity this year as compared with the 1950 season. An early frost, on September 12, possibly accounts for the generally lower specific gravities, since few varieties were mature on this date. In the "high starch" varieties, however, Noordeling produced a specific gravity of 1.124 as compared with 1.126 last year.

Verticillium

In Idaho table 7 is shown the distribution of 9 family lines in relation to verticillium resistance. The families A 101 and A 102 both have susceptible Russet Burbank as one parent, while families A 1 and A 101 have the resistant Menominee as one of the parents. When 1 resistant parent was used in the cross, 64 to 100 percent of the progeny fall in the first 2 classes, with 100 percent in the first 2 classes when both parents were resistant.

Idaho table 7. The distribution of family lines for verticillium resistance. McLean

	Average verticillium index					
	0-10	11-20	21-30	31-40	41-50	Over 50
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Both parents susceptible						
B 2365	--	16.6	58.4	25.0	--	--
A 102	40.6	14.8	11.1	22.2	7.4	3.7
Both parents moderately resistant						
B 2754	18.2	31.8	27.3	13.7	4.5	4.5
Resistant x susceptible parents						
A 101	71.5	28.5	---	---	---	---
B 2913	51.6	12.9	19.3	12.9	3.3	---
Resistant x moderately susceptible parents						
B 2900	40.0	30.0	10.0	10.0	0.0	10.0
B 3018	55.5	22.2	11.1	0.0	11.1	---
Both parents resistant						
B 3019	100.0	---	---	---	---	---
A 1	71.5	28.5	---	---	---	---

SOUTHERN PROJECT
(LOUISIANA HEADQUARTERS)

T. P. Dykstra

The principal objectives of the potato program for the Southeastern States are:

1. Production of early, high-yielding, red-skinned varieties, resistant to late blight and well adapted to growing conditions of the deep South, as well as to those of the seed-producing areas in the North.

2. Production of high-yielding, white varieties of medium maturity, resistant to late blight and well adapted to the high elevated late-maturing sections of Tennessee, Georgia, and North Carolina.

3. Increase of new seedlings. Maintaining these free from virus infection and testing them for resistance to late blight and scab.

4. Development of scab-resistant varieties. This is important but not essential as late-blight resistance.

5. Distribute promising seedlings to cooperators in the Southeastern States to be tested for adaptability and yield.

Procedure

Each year crosses are made in the field at Crossville, Tenn. Conditions for making crosses and developing true seed are not ideal, but in some years fairly satisfactory results are obtained. As a whole, it is perhaps one of the best locations in the deep South to make crosses. Every effort is made to make crosses between red varieties and blight-resistant ones. Not many of the red seedlings are fertile, but more fertile ones are developed each year. In addition to this, some of the most promising red seedlings are sent as parents to Beltsville and crosses are made in the greenhouse by Dr. F. J. Stevenson. The seed developed as a result of these crosses are sent to us. The true seed is planted in flats, and the young seedlings are transplanted in 3-inch pots in the greenhouse provided by the Louisiana State Experiment Station at Baton Rouge. The seedlings from crosses of which at least one parent is resistant to late blight are placed in the moist chamber and are inoculated with spores of Phytophthora infestans to test for resistance to late blight, as described in last year's report. Seedlings from scab-resistant parents are tested in the cold frame in scab-infested soil to determine degree of resistance. At least one tuber from each plant is saved to be planted for increase in Tennessee. Tubers from desirable crosses grown in Maine and having characteristics desirable for the South, are also shipped to us by Dr. F. J. Stevenson. We have also received desirable red seedlings from W. C. Edmundson of Greeley, Colo., and from Dr. H. O. Werner of the University of Nebraska to test for adaptability in the South.

The increase plots are maintained at the Cumberland Plateau Experiment Station at Crossville, Tenn., a branch station of the Agricultural Experiment Station of the University of Tennessee. Completely isolated plots in the woods are maintained, assuring freedom from virus infection. The higher elevation of the Plateau, extending over five million acres, causes the average temperature to be at least 10° lower than at Knoxville, a distance of 70 miles from Crossville. This necessitates planting the middle of April and harvesting the middle of August, at which time reports on performance of seedlings in cooperating States are available, and these reports are used to determine the seedling varieties to select for the different States.

To those not familiar with conditions existing in the South, it may appear illogical to place so much emphasis on color of skin of tubers. It is not believed that there is any correlation between color of skin and other desirable qualities of the potato, but because the Bliss Triumph has been grown almost exclusively in the early potato growing sections of the South, red color is associated in the public mind with the concept of early potatoes. During the early season a premium is paid for red varieties when it may be difficult to dispose of white varieties. It is a well known fact that it is easier to meet the demands of the public, even if these are illogical than to change accepted ideas on color of food products.

Whenever the Bliss Triumph is growing under ideal conditions it has been a very satisfactory variety. It is, however, very sensitive to adverse growing conditions, and it is susceptible to most if not all potato diseases.

Late blight is a limiting factor in potato production in the South; more so than in most of the Northern States. The reason for this is that in the North growers are prepared to spray, whereas in the South few growers have spraying or dusting equipment. As a result of the sporadic occurrence of late blight in the South during the last decade, complete failure of the potato crop has often occurred on individual farms. A majority of growers prefer to discontinue growing potatoes rather than to be bothered with spraying, and as a result the potato acerage in the South has been greatly reduced.

In the Cumberland Plateau in Tennessee and in the mountainous section of Georgia and of North Carolina, white varieties are grown exclusively. In these areas Kennebec, Pungo, and Cherokee have given very satisfactory performance.

Scab occurs in the South and in some areas is of considerable importance, but as a whole it is of minor importance compared with late blight. In making crosses an effort is always made, if possible, to combine late blight with scab resistance, and preferable in red-skinned varieties.

To determine which seedlings should be increased and which discarded after selections have been made, comparatively small lots of desirable seedlings of recent development are shipped to cooperating States. The ones that appear to be promising are tested the following year in the same locality

on a larger scale. Sufficient tubers of these varieties which have proved promising for 2 or more years are shipped to cooperators to be included in a yield plot.

Mainly red seedlings are shipped to Fairhope, Ala.; Homestead, Fla., Baton Rouge, La.; Savannah, Ga.; San Benito, Rio Grande Valley, Tex.; and Newton, Miss.

Mainly white varieties are shipped to Hastings, Fla.; Bell Glade, Fla.; Blairsville, Ga.; Charleston, S. C.; and Mountain Station, N. C.

The varieties that were sent to cooperating stations in the South are listed in Dykstra table 1. Dykstra table 2 gives the yield data on seedlings and varieties grown at Baton Rouge in 1951.

Dykstra table 1. Numbered varieties sent to cooperating stations in the South in the fall of 1951.

State	Varieties	Resistant to blight	Resistant to scab	Red seedling	White seedling
Alabama	21	5	---	21	----
Florida, Homestead	53	6	24	53	----
Florida, Hastings	57	28	7	--	57
Georgia, Savanah	13	2	---	12	1
Georgia, Mountain Station	17	5	2	--	17
Louisiana	26	9	9	10	6
Mississippi	29	3	3	28	1
North Carolina	21	10	3	--	21
South Carolina	24	9	4	--	24
Texas	93	22	7	64	29

Dykstra table 2. Yield of potato seedlings and varieties grown at Baton Rouge, La., 1951.

Variety or seedling	Mean yield of U.S. No. 1 tubers per acre 1/	Specific Gravity
	Bu.	
1345	183	1.075
9887	130	1.075
7724	39	1.080
257	163	1.085
6574	48	1.070
8439	45	1.085
96-56	158	1.080
73-10	183	1.075
Bliss Triumph	82	1.080
DeSoto	142	1.080
La Soda	217	1.075
Kennebec	153	1.085
White Cloud	175	1.075
Progress	128	1.080
20-44-2	117	1.080
25-42-2	165	1.075
209-43-1	192	1.080
213-43-2	82	1.075
213-43-3	138	1.080
217-43-1	190	1.075
311-43-1	140	1.095

L.S.D. 5% = 12.5 bushels

1/ Mean of four 25-hill plots

Results of Performance of Seedlings in Cooperating States During the Spring of 1951

Homestead, Fla.

George D. Ruehle

This is a very early-potato-growing section. Potatoes are planted in November and harvested in January. It produces primarily red-skinned varieties.

Seedling 1354 was outstanding for yield in this test (Dykstra table 3). The tuberswere of good uniform shape and appearance and of medium size. The table quality of this seedling was excellent, and it appears to be promising although the skin color is not as deep red as in Bliss Triumph. Tubers produced by seedling 1345 were quite similar to 1354 in color, shape, and size. The other

lots produced tubers of a very deep red to purplish red color, but scab and other skin defects were common.

Dykstra table 3. Results from non-replicated potato variety yield trial.

Seedling variety numbers	Total yield per acre	Total U.S. #1	Scabby tubers	Appearance of U.S. #1 tubers
	Bu.	Bu.		
1354	493	459	9	Good color and shape, medium size
1345	362	339	3	Good color and shape, medium size
217-43-1	351	174	150	Deep red but many faded or with dull russeted skin.
213-43-2	307	162	122	Color generally good but many with dull russeted skin.
311-43-1	300	213	41	Purplish red and generally good appearance.
213-43-3	299	91	190	Good shape and color.
25-42-2	383	158	192	Poor, scurfy, russet and rhizoctonia masking skin color.
20-44-2	290	201	53	Deep red color. Appearance and shape good, but scurfy at stolon ends.
209-43-1	353	57	270	Deep red color but surface with considerable dull solid russet scurf.

Samples of 14 seedlings were grown for an observation trial. Form 18 to 30 plants of each seedling were grown under the same program of fertilization, cultivation, and spraying as that for the varietal trials. The results of this test are given in Dykstra table 4.

Dykstra table 4. Results from observational trials.

Seedling No.	Hills	Yield per plot			Appearance
		Total	U.S. #1	Scabby	
	No.	Lb.	Lb.	Lb.	
363	22	19	16	0.0	Good
366	19	58	38	13.0	Good except for scab.
368	27	32	23	5.0	Good but considerable rhizoctonia.
340	31	41	23	12.0	Good, but light russet.
1302	28	36	24	7.0	Good, but light russet.
1337	18	47	27	15.0	Very good
3260	26	15	13	.5	Fair, slightly irregular.
3263	25	19	16	.25	Fair
3266	23	20	18	.0	Good
3276	30	30	27	.5	Good
3283	24	27	20	2.0	Good
3295	29	37	20	14.00	Good, but light russet.
3316	21	26	21	.0	Good
3325	20	17	13	.25	Fair, but considerable russet.

Hastings, Florida

A. H. Eddins

The Hastings area prefers white-skinned varieties, although 2 or 3 of our most promising red-skinned selections could be included in seedlings sent to be tested for adaptability. Of the 20 seedlings shipped last year, 9 selections yielded less than 2 pounds of marketable tubers per hill and were dropped from future tests. Of the remaining 11 selections, which yielded 2.0 to 2.8 pounds per hill, two seedlings, 584 and 2778, produced knobby tubers. The remaining 9, namely, 4022, 2830, 3288, 658, 2109, B 4022, 2740, 1236 and 1894, appeared to be promising and should be included in a replicated yield test in 1952.

Mountain Experiment Station, Georgia

J. E. Bailey

A medium late-maturing white, blight-resistant variety is desired for this area. Of the 32 seedling varieties tested seedlings 366, 1345, 368, 2103, 1500, 1574, 1354, 1337, 658 were selected to be tested on a larger scale next year.

Clemson College Truck Experiment Station
Charleston, South Carolina

William N. Epps

The requirements for this potato-growing area is a potato that resembles Sebago or Katahdin, namely, smooth and white, either oval or round, which carries resistance to late blight and scab. The variety must also be able to withstand shipment and to make good potato chips. An early high-yielding potato is desired.

Several of the seedlings tested at Charleston looked very good, and others did poorly. The early-maturing seedlings suffered from drought worse than the medium- and late-maturing ones.

Adverse weather conditions made it difficult to properly evaluate the seedlings. Seedlings 580 and 2109 looked very good, and 1574, 1302, 2350, 584 also looked good.

Mississippi State College
Branch Station at Newton

W. Anderson

This year the potato plots were planted at Newton instead of at State College. Ordinarily, growing conditions in this section of the State are favorable for potato production, but the spring of 1951 was unusually dry. For this reason it was extremely difficult to make accurate readings on performance of seedlings.

The selection had to be based entirely on shape and color of tuber and yield ignored. On this basis, of the 37 seedlings tested 12 were selected to be tested again in 1952.

A red variety is preferred in Mississippi, but a good early, white, blight-resistant variety could be grown commercially. Southern stem blight caused by Sclerotium rolfsii is one of the limiting factors in potato production. In some sections of the State it is impossible to grow potatoes, since 90 percent of the plants may become infected. So far, tests have not revealed any seedling or commercial variety to be resistant to this fungus.

Fairhope, Alabama

Frank Garrett

An early, blight-resistant red-skinned variety is needed for Baldwin County, for the early spring crop. On account of its close proximity to the Gulf, fogs and heavy dews are common, providing ideal conditions for the development of late blight. This disease occurs practically every year. In addition to Bliss Triumph, Sebago is also grown extensively and dug after the red varieties have been harvested. So far, Kennebec has not proved to be satisfactorily adapted to growing conditions in Baldwin County to replace the Sebago.

In the test plot seedlings 366, 368, 1345, 1354, 1396, 4042, 4072, 4451, 4488 looked very promising.

North Carolina State College

F. D. Cochran

The drought and late freezes prevalent during the spring of 1951 in most of the Southern States also occurred in North Carolina. As a result, most of the seedlings planted on the eastern shore and in the mountain gave poor results. Seedlings 2518, 2615, 2732, 2740, and 4022 gave the best performance.

Rio Grande Valley, San Benito, Texas

Late blight and late freezes have in recent years depressed the yield of potatoes in the Rio Grande Valley, and as a result potato acerage has been greatly reduced. The demand is for a red variety that has a brighter red color than Bliss Triumph and is resistant to late blight.

Seedlings 366, 1302, 1345, 1354, 1393, 1396, 1404, 1859, 2349, and 2471 were the best from the standpoint of yield, shape, and color.

Of the 46 seedlings sent by W. C. Edmundson of Colorado, seedlings 9587, 10267, 10282, 10592, 10751, 10729, 11083, 11095, 11098, 11099, 11101, and 11121, were the best and looked promising.

Some red seedlings were sent to us by Dr. H. O. Werner to be tested in different sections of the South (Dykstra table 5). Many of these had a brilliant reddish purple color and gave satisfactory performance in most places tested. If these seedling varieties had late blight resistance in addition to their attractive color, they would be very promising as commercial varieties in the South.

Dykstra table 5. Performance in different sections of the south of red seedling varieties provided by Dr. H. O. Werner.

Seedling numbers	San Benito, Tex.	Baton Rouge, La.	Fairhope, Ala.	Homestead Fla.
)-44-2	Good color and shape.	Bright red color & very good shape.		Deep red color, appearance & shape good, but scurfy at stolon ends.
5-42-2	Good red color and shape.	Good shape & color, but not consistant. Some tubers were practically pink.	Firm skin, good color, and good shape and size.	Russeting and rhizoctonia masking skin color.
)9-43-1	Very good color and shape.	Good color, shape fairly good.	Very susceptible to early blight. Shape & color fair. Tubers small, yield low.	Deep red color, but surface with considerable dull solid russet scurf.
43-43-2	Good red color, but shape only fair.	Good red color, but shape poor.		Good color but many tubers with dull masking color at stolon end.
43-43-3	Bright red color, promising.	Good color, but tubers rough.		Good shape & color.
47-43-1	Good color, but tubers not too smooth.	Very good color & shape		Deep red color, but faded with dull russeted skin.
41-43-1	Beautiful red, color, good size, good set. Late.	Dark red color. Shape fairly good.	Beautiful red color, good size, & good set. Late.	Purplish red & generally good appearance. Good shape & color.
ogress	Many small tubers.	Too many growth cracks.	Many small-sized tubers.	

U.S.-COLO. POTATO FIELD STATION (Greeley, Colo.)

W. C. Edmundson

Potato-breeding tests for the year 1951 consisted of breeding for scab resistance with better cooking quality in red and white varieties. Most of the parent material was supplied from Beltsville, Md.; to this was added the most promising scab-resistant lots developed at Greeley. A number of seedlings supplied from Beltsville carried a factor for blight resistance.

The 1951 tests included the first-year seedlings in family lines, second-year seedlings in 5-hill lots, increase plot in 32-hill lots, older seedlings tested on a field basis, and yield tests of seedlings and new varieties.

In addition to test plots at the station, the more promising seedlings were tested on two farms in the early potato section at Gilcrest, Colo. Seedlings were also supplied for tests in other parts of the State. A large test plot was planted at Eaton, Colo., by J. S. Gregory, Colorado State Experiment Station, and Dr. L. A. Schaal. Extensive tests for scab resistance were made by Dr. Schaal at different locations throughout the State.

The growing season of 1951 was very unfavorable for potato production, especially in the Greeley district. The yield per acre for the district was low and the quality of the crop was poor. Late blight appeared in the fields the latter part of August, causing the vines to die very early. Flea beetle injury was also very severe, because a proper spray program could not be carried on owing to wet soil with the potato vines matted between the rows. Because of unfavorable growing conditions, some commercial varieties developed irregular shape with much second growth. Extreme high and low temperatures, together with an excess of rain, occurred during the summer. From April 1 to October 22, 13.54 inches of rain was recorded at the station, which is double the amount generally recorded for the same period. The psyllid population was low in 1951, according to counts made of the psyllids in the check plot of the spraying experiment. All seedling plots were sprayed three times and dusted once with DDT and Parzate. A spray of DDT properly applied the latter part of August probably would have eliminated much of the flea beetle injury. Flea beetle injury is always most severe in wet seasons.

The family lines of the 1951 seedlings were planted May 16. Planting the family lines the middle of May has given better results than planting the first part of June. At harvesttime 1,059 hill selections were made. These lots will be planted in 5-hill lots in 1952.

In the test of 5-hill lots, 777 seedlings were included. These lots have been carefully examined, and those infected with scab or indicating a tendency to growth crack have been discarded. All lots that were retained for further tests will be planted on a tuber-unit basis in 30-hill lots in 1952. The type and appearance of the seedlings were somewhat

disappointing this year, probably due to the unfavorable growing conditions.

One hundred fifty-six older seedlings were planted in 32-hill lots on a tuber-unit basis. All lots were retained at time of harvest for closer study, and later were carefully examined for scab, growth cracks, and other defects. The best of these lots have been retained for planting at the station in 1952. The most promising of these lots will be planted at Gilcrest for the early crop and also in other parts of the State.

Of the older seedlings 34 were planted on a field basis, some were in half-row plots, some in full-row plots, 535 feet long. Other seedlings were planted in larger lots. The plantings were on a tuber-unit basis. One-half acre of Seedling 6362 was grown at the station this year. This seedling appears to be very promising for the Greeley district both for the early and the late crop. Seedling 6362 produces tubers of very good type, with shallow eyes, good skin, and a high percentage of No. 1 tubers. It is not scab-resistant, but develops much less scab than most commercial varieties grown in the district. It will be tested quite generally in 1952 for both the early and the late crop.

Seed of 67 crosses was planted in the greenhouse August 12, the seed being developed from crosses made the previous spring in the greenhouse. Owing to the irregular germination of the seed, the plants were potted on two different dates, September 17 and 18, and October 2 and 3.

The seedlings that were potted on the earlier dates produced larger tubers than the ones potted later. The tubers were especially well developed this year. Seed from 31 crosses in which red parents were used were included in the plantings; however, only a small number of dark-red tubers were obtained. A list of the red parent crosses, together with the number of dark-red, medium-red, light-red, and white tubers produced, are included in Greeley table 1. Note that only 4 dark-red and 64 medium-dark red tubers were developed from a total of 3,439 tubers resulting from red tuber crosses.

In two yield tests, 56 seedlings and varieties were included. The tests included seedlings from Maine, Nebraska, and Colorado. Some named varieties were also included. The plots consisted of 25 hills, randomized and replicated 5 times. Greeley table 2 and table 3 give the mean yield in total bushels per acre, also the mean yield of tubers above 2 inches in diameter on a percentage basis.

From each of the 5 replications, 30 tubers were used to determine the specific gravity of each seedling or variety. The specific gravity was very low in 1951, owing to the early infestation of late blight, the vines being killed 2 to 3 weeks before the normal maturity period. Comparing the specific gravity of Katahdin for 1951 with that for 1950, a near normal year, gives an indication of the low starch content of the 1951 crop. The specific gravity of Katahdin in 1951 in one yield test plot was 1.070; in the other 1.071. In 1950 the specific gravity was 1.085.

Greeley table 1. Seedling-family lines, red crosses, 1951, Greeley, Colo.

Cross No.	Parentage, reds x reds	Dark red	Medium dark red	Light red	White	Total
		No.	No.	No.	No.	No.
37	B 2102-12 x C.S. 7846R		3	8	112	123
38	B 56-9R x B 2131-3R		7	14	160	181
39	B 2131-3 x C.S. 7724R			3	58	61
40	B 400-1R x B 2337-2R			10	67	77
41	B 874-108 x B 2337-2			14	73	87
42	C.S. 10184 x C.S. 7846		8	22	104	134
43	C.S. 9741 x C.S. 7724	1	4	32	59	96
44	B 381-2 x C.S. 7724		8	36	122	166
45	B 56-9 x C.S. 7724	2	1	13	37	53
46	B 2159-1 x B 2337-2	1	8	24	88	121
47	C.S. 9741 x C.S. 7846			21	52	73
48	C.S. 7846 x C.S. 7724			7	20	27
49	B 2333-7 x B 2337-2			12	57	69
50	B 2131-3 x B 2337-2		1	20	70	91
51	B 874-108 x B 2368-17		1	6	29	36
52	C.S. 8439 x C.S. 7846		3	8	52	63
53	B 9159-1 x C.S. 7846		6	28	54	88
54	C. S. 9741 x B 400-1		1	44	214	259
55	C. S. 9741 x B 381-2			57	260	317
56	C. S. 7724 x B 2131-3			24	65	89
57	B 2159-1 x B 381-2		11	122	251	384
58	IA46-18-1 x B 400-1		2	38	94	134
59	B 2130-1 x B 381-2			11	73	84
60	C.S. 9741 x B 2337-2			8	19	27
61	B 2337-2 x B 2131-3			21	93	114
62	C. S. 7137 x B 874-108			16	45	61
63	B 2337-2 x C.S. 7724			7	24	31
64	C. S. 7137 x B 2337-2			15	59	74
65	B 2162-18 x B 381-2			10	64	74
66	B 2067-1 x B 381-2			3	12	15
67	B 400-1 x B 874-108			19	211	230
	Total	4	64	673	2,698	3,439

Greeley table 2. Yield test of seedlings and varieties, Greeley, Colo., 1951

Variety or seedling No.	Mean yield per acre	Mean yield above 2 in.	Mean specific gravity	Starch
	Bu.	Pct.		Pct.
Cherokee	468	94	1.077	13.42
B 381-2	375	85	1.075	12.92
B 773-8	489	96	1.075	12.92
B 904-6	465	94	1.068	11.45
B 920-7	508	95	1.073	12.43
B 920-12	249	83	1.060	9.99
B 926-9	409	95	1.064	10.72
B 961-20	413	95	1.070	11.94
B 962-1	348	94	1.073	12.43
B 962-3	356	93	1.082	14.40
B 962-9	357	72	1.087	15.43
B 962-16	278	91	1.085	15.17
B 991-3	442	93	1.073	12.43
B 991-6	158	91	1.064	10.72
B 991-13	318	96	1.071	12.17
B 2067-18	395	91	1.071	11.17
B 2067-21	413	90	1.066	10.95
B 2067-97	369	87	1.071	12.17
B 2160-21	478	93	1.056	-----
C.S. 5244	440	84	1.070	11.94
C.S. 9887	461	87	1.056	-----
C.S. 6362	482	94	1.061	9.99
Katahdin	396	91	1.070	11.94
Satapa	547	93	1.064	10.72
Progress	378	67	1.065	10.72
Triumph	554	94	1.063	10.46
DeSoto	456	74	1.063	10.46
B 991-14	158	90	1.063	10.46
L.S.D. 5%	63	6.74	.0038	
L.S.D. 1%	83	8.92	.0050	

Greeley table 3. Yield test of seedlings and varieties, Greeley, Colo., 1951

Variety or seedling No.	Mean yield per acre	Mean yield above 2 in.	Mean specific gravity	Starch
	Bu.	Pct.		Pct.
N. 38-42-3	423	87	1.065	10.72
N. 209-43-1	498	91	1.065	10.46
N. 25-42-2	534	86	1.065	10.72
N. 140-42-1	526	90	1.059	9.00
N. 60-44-1	460	48	1.060	9.00
N. 225-43-1	529	88	1.071	12.17
N. 217-43-1	472	89	1.062	10.23
N. 213-43-3	478	92	1.065	10.72
N. 204-43-1	428	88	1.066	10.95
N. 311-43-1	470	83	1.076	13.16
N. 213-43-2	413	91	1.068	11.45
Triumph	559	96	1.065	10.72
C.S. 9964	409	79	1.062	10.23
Kennebec	531	91	1.078	13.65
C.S. 10087	380	88	1.062	10.23
C.S. 10110	443	86	1.067	11.19
C.S. 10135	428	66	1.073	12.43
C.S. 10204	450	91	1.067	11.19
C.S. 10206	368	78	1.072	12.43
C.S. 10212	384	71	1.068	11.45
C.S. 10213	473	91	1.059	-----
C.S. 10236	454	91	1.063	10.46
Katahdin	471	93	1.071	12.17
C.S. 10271	457	40	1.067	11.19
Kasota	445	83	1.065	10.72
Waseca	438	94	1.063	10.46
C.S. 9947	440	86	1.074	12.67
Chisago	367	86	1.063	10.46
L.S.D. 5%	69	5.75	1.984 x 0.0019 = 0.0038	
" 1%	91	7.61	2.626 x 0.0019 = 0.0050	

ALABAMA

C. L. Isbell

A planting was made February 16 at Auburn, Ala., to compare several of the newly introduced varieties and some of the yet unnamed strains with older varieties.

The soil used was a sandy loam of low to medium fertility, which was fertilized one day before planting with 4-10-7 at the rate of 750 pounds per acre. One month later, or March 16, 1951, 4-10-7 was used as a side dressing at the rate of 750 pounds per acre, and on April 3 nitrate of soda was applied as a side dressing at the rate of 150 pounds per acre.

Planting stock was supplied by the United States Department of Agriculture. Seed pieces were 1½ ounces and planted 12 inches apart in the drill. Each variety was represented by 1 row, 25 feet long, in each of 4 plots with a buffer row opposite the outside row on each side.

The yield data for this test are given in Alabama table 1.

Alabama table 1. Yield data from potato variety trials grown at Auburn, Ala. in 1951 1/

Variety	Yield per acre			Harvest notes on tubers 2/
	U.S. No.1	U.S. No.2	Total	
	Bu.	Bu.	Bu.	
Russet Burbank	50	52	154	Knobby, much second growth
Sequoia	116	30	178	Smooth, sprouts 1 to 4 inches long
Antono	92	62	191	Smooth, " ½ to 1 " "
Triumph	98	35	164	Smooth, without sprouts
Kennebec	108	26	156	" " "
Katahdin	94	40	172	" " "
Potomac	69	39	147	Smooth, sprouts 1 to 2 inches long
Tungo	108	31	161	Clean, slight russet sprouts ½" "
B 73-10	92	30	139	Slight russet, some pear-shape, no sprouts
Irish Cobbler	91	38	158	Smooth without sprouts
Sebago	88	45	165	" " "
Cherokee	96	36	157	" " "
Pontiac	117	37	185	" " "
Teton	80	34	31	" " "

1/ Planted 2-16-51; harvested 6-5-51.

2/ No decay was observed in any of the tuber lots.

Pontiac, Pungo, Kennebec, and Sequoia yielded more than 100 bushels U.S. No. 1 tubers per acre. All others yielded less than 100 bushels of U.S. No. 1's. Russet Burbank was the lowest in rank, with 50 bushels of U. S. No 1 tubers per acre.

California

Glen N. Davis

In 1951 ten varieties of potatoes were tested for yield in replicated plots and 43 varieties and seedlings were tested for resistance to common scab.

The yield test was located at the U.S.D.A. Cotton Experiment Station at Shafter. Ten varieties, including White Rose as the check, were replicated 5 times, 25 seed pieces per replication. Yield data (California table 1) show that in 1951 no variety outyielded White Rose; 6 varieties equalled the check; and 3 were significantly lower in yield.

California table 1. Potato variety test, Shafter, Calif., 1951

Kind	Yield					Total	Mean	Specific gravity	Starch
	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5				
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.			Pct.
White Rose	59.0	58.0	56.0	56.0	51.0	280.0	56.0	1.089	15.9
Chippewa	34.0	39.0	48.0	42.0	39.0	202.0	40.4	1.077	13.4
Kennebec	51.0	54.0	40.0	50.0	47.0	242.0	48.4	1.093	16.7
Menominee	45.0	44.0	46.0	47.0	53.0	235.0	47.0	1.088	15.6
Teton	38.0	38.0	44.0	38.0	42.0	200.0	40.0	1.091	16.4
Sequoia	59.0	54.0	54.0	55.0	49.0	271.0	54.2	1.090	16.1
Mohawk	45.0	52.0	32.0	52.0	35.0	216.0	43.2	1.092	16.4
Cayuga	50.0	42.0	39.0	43.0	37.0	211.0	42.2	1.096	17.4
Pontiac	61.0	51.0	52.0	60.0	58.0	282.0	56.4	1.083	14.6
Katahdin	54.0	47.0	45.0	51.0	48.0	245.0	49.0	1.087	15.4
Total	496.0	479.0	456.0	494.0	459.0	2,384.0			

Least sig. dif. = 12.9 lb between means
Least highly sig. dif. = 17.4 lb. between means.

The plot testing for resistance to scab was planted on the S. A. Camp ranch. Here again the variety White Rose was considered the check. It may be noted (Calif. table 2) that the variety Menominee and four seedlings were sufficiently resistant so that 100 percent of the tubers were marketable. Six or seven other seedlings exhibited a high degree of resistance; however, from the limited populations only the variety Menominee and the seedling B 216-3 produced tuber types and high enough yield to suggest commercial possibilities. Increased size of plantings might change this picture somewhat.

California table 2. Potato scab-resistance test plot, Kern County, 1951.

Kind	Tubers	Tubers in class rating								Avé.	Type lesion	Market-able
		0	1	2	3	4	5	6	7			
	No.	No.	No.	No.	No.	No.	No.	No.	No.			Pct.
B 961-20	35	35								0.0	---	100
B 2161-3	68	56	10	2						Tr.	---	100
Menominee	55	52	2	1						Tr.	---	100
B 2162-36	61	57	3	1						Tr.	2	100
B 920-12	44	41	3							Tr.	1-2	100
B 2160-21	60	35	18	6	1					.5	2	98
B 920-7	37	26	5	4	2					.5	2	94
B 579-11	42	17	23	1	1					.7	2	92
B 56-1	28	12	14	0	2					.7	2	93
B 2067-25	38	20	11	4	0	2	1			1.0	5	92
5926-9	40	20	11	4	3	2				1.0	2	87
B 2159-1	49	17	21	9	2					1.0	2	95
B 911-10	36	15	12	2	2	5				1.2	5	80
B 2329-17	69	20	25	15	8	1				1.2	3-5	87
B 962-3	34	11	7	9	7					1.3	2	79
B 991-3	30	4	12	10	4					1.4	2-3	86
B 2596-18	58	18	20	9	4	4	3			1.4	2-3	81
B 2337-7	45	13	13	8	10	1				1.4	2	75
B 962-1	47	19	5	11	4	8				1.5	2-3	74
B 2338-44	36	0	17	16	3					1.6	2	91
B 922-6	38	7	14	9	5	3				1.6	3-5	79
B 773-8	42	6	11	15	10					1.7	3-5	76
B 780-27	42	2	14	16	9	1				1.8	5	76
B 2346-8	55	14	12	6	12	9	2			1.9	2-3	58
B 402-1	45	10	9	11	6	8	1			1.9	3	66
B 725-8	31	8	7	4	4	4	4			2.0	2-3	61
B 991-6	31	0	11	11	5	4				2.0	2	70
B 922-3	52	5	8	13	13	9	4			2.5	3-5	50
B 904-6	39	1	8	8	11	8	3			2.6	5	43
B 721-35	44	0	7	11	17	7	2			2.7	2-3	39
1818	48	0	10	10	15	8	5			2.7	3-5	41
B 2628-81	67	2	7	18	25	15	1			2.7	2	36
B 2067-18	58	4	6	10	21	12	5			2.8	3-5	34
B 922-5	55	3	8	14	10	15	3	2		2.8	3-5	45
B 962-9	71	2	8	14	22	17	8			3.0	2-3	31
B 721-1	43	0	6	7	17	11	1	1		3.0	3-5	30
B 962-16	39	0	3	9	12	9	4	2		3.2	2-3	30
B 919-15	38	0	2	6	17	11	2			3.4	2-3	21
B 2368-17	60	2	0	5	24	21	7	1		3.4	1	11
B 605-10	57	0	2	6	9	22	12	6		4.0	3	14
B 738-16	26	0	0	2	2	8	9	4	1	4.5	3	7
B 911-31	68	1	0	0	0	29	22	11	5	4.8	3	1
Wn. Rose, Ck.	79	11	2	2	4	12	21	24	3	4.4	3-5	6

Key to classes of scab

0 = Free from scab
1 = 1% of surface area covered with scab (trace)
2 = 5% " " " " " ".
3 = 15% " " " " " ".
4 = 25% " " " " " "
5 = 35% of surface area covered with sca
6 = 60% " " " " " "
7 = 90% " " " " " "

Classes 0, 1, and 2 considered marketable.

Hollister Potato Test Plot, 1951

The potato variety trial in San Benito County was planted on the Nyland ranch between Hollister and San Juan. The plot was located in a commercial field and except for planting received the same cultural treatment as the commercial crop.

Unfortunately the piece of land used was not ideal for a test plot. Part of the plot was on the upper side of an irrigation ditch and part on the lower side. The portion of the plot below the ditch suffered for want of water because of the fall of the land and the short rows. This did not become fully evident until harvest. The yield of the replications below the ditch was so much less for the same varieties than that above the ditch that it was plainly evident they had not been given a fair trial. As a result, the mean weight of the replicates above the ditch only are recorded, and no attempt at statistical analysis was made.

Specific gravity tests were run on each variety in the planting. California table 3 shows the yield, specific gravity, dry-matter content and percentage starch of the different varieties tested. The variety Russet Burbank (Netted Gem) was considered the check.

Calif. table 3. Hollister potato variety trial, 1951.

Kind	Replicates	Yield per replicate	Specific gravity	Dry matter	Starch
	No.	Lb.			Pct.
Russet Burbank	5	20.2	1.075	18.6	12.9
Pontiac	2	30.0	1.072	17.9	12.2
Yampa	1	11.0	1.081	19.9	14.1
Essex	1	22.0	1.072	17.9	12.2
Teton	3	29.0	1.074	18.4	12.6
Katahdin	3	29.0	1.078	19.2	13.5
Menominee	3	29.5	1.073	18.1	12.4
Mohawk	4	19.9	1.079	19.8	13.9
Cayuga	3	22.0	1.086	21.2	15.2
Chippewa	4	17.2	1.070	17.5	11.7
Kennebec	4	29.4	1.070	17.5	11.7
Sequoia	3	37.7	1.073	18.1	12.4
Ontario	2	19.0	1.076	18.8	13.1
Kasota	3	15.3	1.074	18.4	12.6

Planted 6/27/51
Harvested 11/7/51

The plot was observed at intervals during the summer and fall, and a record of the decline of the vines due to Verticillium wilt recorded. These data are recorded in California table 4.

Calif. table 4. Potato test plot, Hollister, 1951, Record of vine decline.

Kind	Appearance of plants on:				
	9/19	9/26	10/3	10/10	10/17
Russet Burbank	O	O	X		
Pontiac	OK	O	X		
Yampa	X				
Essex	OK	O	O	X	
Teton	O	O	X		
Katahdin	OK	O	O	X	
Menominee	OK	OK	OK	O	X
Mohawk	OK	OK	O	X	
Cayuga	OK	OK	O	X	
Chippewa	OK	O	O	X	
Kennebec	O	X			
Sequoia	OK	OK	OK	O	X
Ontario	OK	O	O	X	
Kasota	O	X			

OK = Plants normal in appearance.
O = Declining.
X = Dead.

CONNECTICUT

Arthur Hawkins

Three yield tests were conducted in Connecticut in 1951 at Wapping, Ellington, and Milford. The data for these tests are given in Conn. tables 1, 2, and 3, respectively.

At Wapping some of the yields were relatively high (Conn. table 1) in spite of the fact that on September 17 the varieties were with few exceptions dead or practically dead. Most of the vines were killed by late blight but some by early blight, which set in later, as on Kennebec. A number of varieties produced off-shaped tubers, as can be seen by the difference between the yields in bushels per acre of the total over 2 inches in diameter and the bushels per acre free from off-shapes. Twelve of the fifteen varieties produced varying percentages of tubers over 4 inches in diameter.

Conn. table 1. Potato variety trial - Wapping, Connecticut, 1951. College of Agriculture, University of Connecticut, in cooperation with Tom Burgess Jr., Wapping, Conn.

Variety	Total yield per acre	Yield per acre: Over 2 inches good shape		Yield per acre: Over 4 inches	Specific gravity [1/]
	Bu.	Pct.	Bu.	Bu.	
Cherokee	484	92.8	429	0	1.0684
Green Mountain	775	95.7	717	0	1.0828
Katahdin	615	93.5	573	2.3	1.0691
Kennebec	744	97.2	689	5.1	1.0720
Mohawk	716	97.7	664	7.2	1.0691
Pungo	654	98.7	645	11.0	1.0736
Teton	790	97.4	766	2.8	1.0697
B-73-10	571	93.3	525	.4	1.0703
B-355-44	591	95.9	549	5.5	1.0814
B-446-8	852	94.5	751	3.9	1.0616
B-447-98	469	88.0	410	0	1.0725
B-606-67	995	96.4	817	2.6	1.0799
B-637-14	651	97.1	587	9.7	1.0659
Russet Rural	664	96.2	631	.8	1.0776
Houma	699	91.4	630	2.1	1.0770

1/ Specific gravity by salt solution method. Av. of 10 tubers per sample x 4 replicates.

The data for the potato variety tests at Ellington are given in Conn. table 2. Again the total yields were relatively high but off-shapes and over-sizes reduced the yield of tubers over 2 inches in diameter that were free from abnormalities.

When rotobeated on September 20 some varieties had green foliage as follows: Green Mountain, 25%; Mohawk, 10%; and Houma, 10%. Kennebec and several others died early due to verticillium wilt. Pink eye was found on the Kennebec tubers at harvesttime. The specific gravity was on the average lower at Ellington than it was at Wapping, probably due to less mature potatoes at time of death of plants.

Conn. table 2. Potato variety trial - Ellington, Connecticut, 1951.
College of Agriculture, University of Connecticut, in cooperation with Earl Hatheway, Ellington, Conn.

Variety	Yield per acre				Specific gravity
	Total yield per acre	Over 2 inches good shape		Over 4 inches	
	Bu	Pct.	Bu.	Bu.	
Cherokee	449	85.6	373	--	1.0630
Green Mountain	619	93.1	503	--	1.0787
Katahdin	595	93.4	553	3.8	1.0620
Kennebec	528	89.5	455	.6	1.0616
Mohawk	621	95.7	574	2.3	1.0726
Pungo	498	94.5	467	5.1	1.0640
Teton	609	91.7	554	--	1.0616
B-73-10	486	92.7	451	--	1.0661
B-355-44	393	84.8	325	--	1.0710
B-446-8	548	88.8	471	--	1.0573
B 447-98	365	77.7	284	--	1.0631
B-606-67	715	92.8	573	3.8	1.0724
B-637-14	544	94.1	495	.6	1.0629
Russet Rural	461	92.8	390	.9	1.0685
Houma	747	89.1	664	.8	1.0735

The Milford plot was located one mile from Long Island Sound. The data for this test are given in Conn. table 3. The plots in this test were planted on April 12 and by July 14 considerable stem soft rot was found on many plots.

B 73-10 looked promising under moist soil conditions in which grown. Late harvest Pungo had developed some sprouts. The Cherokee tubers were small and off-shape. Teton yielded surprisingly poor because of early death due to bacterial stem rot and late blight.

Conn. table 3. Yields of potato varieties, Milford (New Haven County), Conn. 1951. College of Agriculture, University of Connecticut, in cooperation with Ralph R. Beach, Milford, Connecticut.

Variety	Total yield per acre	Yield per acre		Specific gravity
		Over 2 inches good shape		
	Bu.	Pct.	Bu.	
Kennebec	855	90.7	722	1.0638
Pungo	767	93.4	683	1.0639
B 73-10	720	90.2	594	1.0618
Katahdin	560	89.5	450	1.0573
Mohawk	529	93.6	463	1.0668
B 355-44	503	85.5	376	1.0676
Cherokee	488	73.8	299	1.0583
Irish Cobbler	461	86.9	352	1.0650
Teton	438	83.7	307	1.0574

DELAWARE

E. P. Brasher

Through the cooperative efforts between the Delaware Agricultural Experiment Station and the United States Department of Agriculture, the potato variety trials were continued in 1951. Twenty named and numbered varieties and seedlings were tested.

The experimental procedure and conditions were as follows:

Location: University Farm, Newark.

Soil: Sassafras loam.

Previous Crop: Potatoes.

Cover Crop: Rye.

Plot Size: 25 x 3½ feet (29 seed pieces were planted in each 25-foot row).

Plot Design: Randomized block.

Replications: Five.

Planting Date: April 9.

Fertilizer: 1,400 pounds of 8-16-16 per acre, in bands at planting time.

Fungicide: Dithane Z-78.

Insecticide: DDT.

Growing Conditions: During the early part of the season, growing conditions were considered good. In late July and early August, however, hot and dry weather prevailed, which probably reduced the yield of No. 1 potatoes.

Harvesting Date: August 14.

Specific Gravity and Starch: A 5,000-gram sample of potatoes from each replication was weighed under water. The conversion table provided by the U.S.D.A. was then used for the determination of specific gravity and starch content.

The results of this test are shown in Delaware table 1.

Delaware table 1. Yield, specific gravity, and starch content of potato varieties and seedlings grown at Newark, Delaware, 1951.

Variety or Seedling	Yield per Acre 1/ U.S.No. 1	Yield per Acre 1/ U.S.No. 1 + U.S.No. 2	U.S. No. 1	Specific Gravity 1/	Starch Content 1/
	Bu.	Bu.	Pct.		Pct.
Essex	340	439	77	1.0622	10.141
Sebago	321	376	85	1.0720	12.230
Mohawk	277	300	92	1.0725	12.333
Sequoia	315	356	88	1.0707	11.948
Katahdin	279	329	85	1.0732	12.478
Chippewa	345	406	85	1.0668	11.109
Teton	371	428	87	1.0702	11.841
Irish Cobbler	274	326	84	1.0739	12.628
Pontiac	378	423	89	1.0642	10.569
Red Warba	225	295	76	1.0681	11.396
X1276-185	312	372	84	1.0692	11.640
Marygold	355	399	89	1.0729	12.431
Kennebec	369	398	93	1.0766	13.215
B73-18	302	318	95	1.0846	14.918
B355-35	295	347	85	1.0745	12.774
B355-44	287	333	86	1.0848	14.969
B446-8	317	370	86	1.0665	11.058
B447-98	195	272	72	1.0711	12.042
B637-14	364	404	90	1.0658	10.912
B606-67	339	383	88	1.0759	13.069
L.S.D. 5% Level	68	77		0.0033	0.813
L.S.D. 1% Level	90	101		0.0044	1.078

1/ Average for five replications.

Of the 20 varieties and seedlings tested, 6 produced significantly greater yields of No. 1 potatoes than that of the standard variety, Irish Cobbler. Many other varieties were equally as productive as Irish Cobbler. Among the 6 highest yielding varieties, Kennebec was the most outstanding because of its high starch content in relation to the other 5 and because it produced a larger percentage of No. 1 potatoes.

Two promising seedlings, B73-18 and B355-44, were revealed in this test. Each of these seedlings contained a starch content that was significantly higher than that of any other variety or seedling tested. Of these two seedlings, B73-18 was rated the highest because it was more attractive and produced a larger yield of No. 1 potatoes. In contrast with standard varieties, B73-18 was also outstanding.

Both in 1950 and 1951, it produced yields comparable with that of Irish Cobbler and Katahdin. For these reasons, together with the fact that it contains a high quality, B73-18 seems very promising for Delaware and worthy of naming.

Probably the most disappointing variety tested in 1951 was Essex. Although it produced large yields, it contained less starch than that of any variety or seedling tested. This was also detected in quality tests. Whether the tubers were baked, boiled, or fried, they were not palatable. Pontiac and B637-14 were other potatoes with low quality.

FLORIDA

A. H. Eddins, E. N. McCubbin and R. W. Ruprecht

Potato Variety Tests At Hastings and Sanford, Florida

Two BPISAE, USDA, seedling selections, two new Canadian varieties, Canso and Keswick, and six other varieties were tested for adaptability and yield at Hastings in 1951. Six varieties were tested at Sanford. The potatoes were not sprayed with fungicides but parathion (1 lb.-100 gals.) was applied twice to control aphids. The growing season was dry and cool and the plants were irrigated when necessary. Results of the tests are given in Florida table 1.

Table 1. - Yields of potato varieties and seedling selections grown at Hastings and Sanford, Florida, in 1951.

Variety or selection 1/	Bushels marketable tubers per acre				Starch
	Hastings		Sanford		
	U.S. 1A	Yield compared with Sebago	U.S. 1A	Yield compared with Sebago	
		Pct.		Pct.	Pct.
Red Pontiac	454	116	271	116	10.467
B 351-44	431	110	---	---	11.687
Kennebec	397	101	294	126	11.944
Sebago	392	---	234	---	10.959
Pungo	375	96	---	---	11.159
Bliss Triumph	357	91	188	80	10.467
1345	349	89	---	---	10.959
Keswick	325	83	217	93	12.436
Canso	321	82	202	86	12.671
LaSalle	262	67	---	---	11.944
Least Significant Difference	66		57		

1/ Five replicates of each grown in 25-hill, single-row, randomized plots with rows spaced 40 inches apart at Hastings and 30 inches apart at Sanford.

Late blight was not present, and no information on the reaction of the different varieties to that disease was obtained. None significantly outyielded Sebago at Hastings, but at Sanford Kennebec yielded 60 bushels per acre more than Sebago, which was significant. Keswick, Canso, and LaSalle produced the lowest yields at the two places. Keswick and Canso, particularly the latter, mature too late. The skin of tubers of the red-skinned selection, 1345, is too dull; and tubers of B 351-44 and Pungo are not as smooth as those of Sebago and thus less acceptable to the trade. LaSalle is eliminated on account of its poor yielding ability.

FLORIDA

A. H. Eddins

Susceptibility of Potato Varieties and Seedling Selections to Corky Ringspot

Twenty-four plants of each of 30 U.S.D.A. seedling selections, Kennebec, La-Salle, Pontiac, Keswick and Canso; and 72 plants of Sebago and 48 plants of Bliss Triumph were grown in soil in which potatoes were affected with corky ringspot in 1950. The potatoes were planted January 15 and the tubers examined for symptoms of corky ringspot when dug May 9. The results are given in Florida table 2. The disease was not very severe, and it was not uniformly distributed throughout the plots as tuber infection varied from 0.0 to 8.4 percent in six rows of Sebago located at different places in the plots. Consequently, selections and varieties that showed no tuber infection may have escaped the disease. B 920-7, B 278-27, and B 73-10 showed the highest rate of tuber infection (7 to 13.4 percent) and may be more susceptible than other selections tested. Three percent of the tubers of Sebago and 1.6 percent of those of Bliss Triumph were affected.

Approximately equal numbers of plants of Sebago, Kennebec, and Bliss Triumph were grown in 9 rows in another section of the plots, and the results were as follows:

Variety	Total tubers	Tubers affected with corky ringspot
	Lb.	Pct.
Sebago	92.4	6.2
Kennebec	81.8	4.4
Bliss Triumph	93.9	1.4

The data indicated that Bliss Triumph is less susceptible to corky ringspot than Sebago and Kennebec. In 1931 Quanjer reported that Bliss Triumph was more resistant to corky ringspot than other varieties grown in Holland. 1/

1/ Quanjer, H. M. The methods of classification of plant viruses and an attempt to classify and name potato viroses. Phytopath. 21: 577-613. 1931.

Table 2. - Reaction of potato varieties and seedling selections to corky ringspot when grown in infected soil in 1951.

Variety or seedling selection 1/	Tubers produced	Tubers affected with corky ringspot	
	Lb.	Lb.	Pct.
B 911-10	30.1	none	0.0
B 920-7	37.7	4.3	11.4
B 884-19	47.5	.4	.8
Bliss Triumph	83.0	1.3	1.6
B 606-3	27.6	none	.0
B 278-27	29.8	4.0	13.4
B 505-75	41.5	0.3	.7
B 905-1	17.0	none	.0
B 61-3	45.9	none	.0
B 76-43	36.5	none	.0
B 355-44	26.1	none	.0
B 73-10	34.4	2.4	7.0
B 721-1	28.5	none	.0
B 355-35	33.3	1.4	4.2
Sebago	134.6	4.0	3.0
B 595-76	37.5	none	.0
B 2098-35	41.5	1.6	3.9
B 381-2	28.5	none	.0
B 605-10	59.1	2.3	3.9
B 780-22	27.9	none	.0
B 351-44	57.5	none	.0
B 930-11	51.4	1.4	2.7
B 595-135	43.4	none	.0
B 313-21	36.6	none	.0
B 926-9	51.4	none	.0
B 616-58	24.2	none	.0
B 355-24	35.1	0.5	1.4
B 294-65	34.3	none	.0
B 738-16	14.5	none	.0
B 294-29	54.4	1.9	3.5
B 936-12	33.4	none	.0
Kennebec	43.2	none	.0
LaSalle	28.8	none	.0
Pontiac	44.9	none	.0
B 962-9	31.5	none	.0
Keswick	40.2	1.1	2.7
Canso	38.2	none	.0

1/ Each grown in 2 replicates in randomized plots with seed pieces planted 1 foot apart in rows 12 feet long and 40 inches apart, except Sebago and Bliss Triumph, which were replicated 6 and 4 times, respectively.

INDIANA

N. K. Ellis

The objectives of the potato-improvement program in Indiana have been: (1) To develop smooth white-skinned potatoes that will come out of the muck soil in which they grow with a minimum of soil clinging to them, (2) to develop scab-resistant varieties, and (3) to improve the cooking quality. Resistance to diseases of all kinds is also of importance.

While cooking quality improvement has been an objective, we feel that progress in this direction has not been fast enough, and greater emphasis must be placed on it. In this territory, where the major commercial production is from the organic soils of the northern part of the State, we are most conscious of the need for cooking quality that will command repeat sales rather than simply eye appeal, which makes the first sale. None of the present named varieties can be depended upon to give consistant production of high-quality table stock. The new introduction, Cherokee, is not the answer to quality because it seems to become especially sweet in storage. The Russet Burbank has the most favorable cooking qualities, but, besides expecting a lower yield, the grower meets sales resistance when selling Russet Burbank grown in the Midwest.

Indiana table 1 gives the results of the yield trial at the Muck Crop Experimental Farm at Walkerton, Ind. The seedlings in this trial were those that had been advanced to the yield trial because of shape, color, and resistance to scab. Now, because of poor yield or cooking quality, all B designated seedlings from this test will be discontinued. CS 6316 did not produce a satisfactory yield in this trial, although its shape is attractive.

Ind. table 1. Variety trial, Walkerton, Ind., 1951. Planted May 16; harvested Sept. 18. Muck soil.

Variety	U.S. No. 1, per acre 100-lb. bags
Cherokee	377.0
Chippewa	428.3
Cobbler	261.8
Katahdin	390.1
Pungo	410.9
Russet Burbank	297.6
Sebago	328.6
Triumph	281.2
CS 6316	244.4
B 62-1	214.4
B 73-10	363.9
B 112-24	350.9
B 505-53	326.7
B 591-47	358.1
B 595-7	350.4
B 595-87	254.5

IOWA

C. E. Peterson, W. J. Hooker, Roland G. Timian
Allen E. Schark, and Frank L. Blankenburg

Seed and Seedling Production

Most crosses made in the greenhouse at Ames involved resistance to scab and late blight. With the development of seedling tests for virus X immunity more use is being made of parents possessing this character. A limited number of crosses also involved resistance to ring rot, virus Y, and leaf roll. Seed production was rather light compared with previous years, and because of intensive screening for late blight resistance and virus X immunity, much larger quantities of seed were required to produce the 1951 crop of seedlings.

In the fall of 1951 over 15,000 seedlings were grown in the greenhouse at Ames. These seedling tubers were smaller than usual and produced fewer of the No. 2 size ordinarily distributed to other States. More than 10,000 seedling tubers will be planted at Clear Lake and about 7,000 tubers will be distributed to other States in 1952. All of the seedling progenies segregating for late blight resistance were subjected to a screening test in flats before transplanting. This screening procedure over the past 4 years has consistently eliminated more than 90% of the seedling plants susceptible to the common race of late blight used. Several progenies were tested in seedling flats for both late blight resistance and virus X immunity. While additional work is needed to standardize procedures, there is evidence that the methods employed this year eliminated most of the seedling plants susceptible to either one or both of these diseases. Methods and results will be discussed in more detail in a following section.

Distribution

Seedling tubers totaling 10,500 from the 1950 greenhouse crop were distributed in 5 States to workers who requested this type of material. In addition to the new seedlings a number of advanced selections were distributed to workers in other States. Of the latter type of material, 382 lots representing over 200 selections were sent to 7 States in the spring of 1951.

Field Plots

Field plantings at Clear Lake, Iowa, were almost completely destroyed by hail and floods in late June. The loss included 21,000 new seedlings in single hills, 751 observation rows, and 32 varieties and selections in replicated yield trials. The greatest loss was that of the new seedlings; however, there was some recovery of this material because the second-size tubers from the greenhouse crop had been distributed and grown elsewhere. Dr. G. H. Rieman made a number of selections in Wisconsin, and these will be included in Iowa plantings next year. About 2,000 single hills of new seedlings survived the

Clear Lake flood. All of the second-year and older selections were grown in seed-increase plots at Northwood, N. Dak. Fortunately, a rather complete collection of second- and third-year selections from Iowa was grown on muck soil at Walkerton, Ind., by Dr. N. K. Ellis. This provided an opportunity to make selections under conditions quite similar to those in Iowa.

Through the cooperation of Dr. W. G. Hoyman a seed-increase plot was grown at Northwood, N. Dak. This planting included 5-hill rows of 177 second-year selections, 10-hill rows of 170 advanced selections and named varieties, and 33 lots planted in quantities of 10 to 100 tuber units.

New Varieties

Cherokee, Kennebec, and 6316 were produced on a commercial scale by a number of muckland growers. Because of severe late blight on older varieties the resistance of Cherokee and Kennebec attracted a great deal of attention. Probably because of its scab resistance there seems to be more interest in Cherokee than in Kennebec. Although Cherokee produced its typical, rather irregular-shaped tubers, very little second growth developed when it was grown on muck soil. Selection 6316 produced attractive scab-free tubers but the vines were damaged by late blight, and in some fields considerable hollow heart developed. Several growers who had both Cherokee and 6316 on muck soil indicated more interest in replanting the Cherokee than in 6316.

A small amount of late-blight tuber rot was observed on both Kennebec and Cherokee. It is not known whether the tuber infection came from foliage lesions on Kennebec and Cherokee or from adjacent susceptible varieties. Although such lesions were not observed it seems likely they might have developed unnoticed and resulted in the tuber infection observed at harvest-time. If this is the case, these varieties will deserve careful attention to see if their resistance will be maintained under more extensive cultivation.

Virus X

Segregates immune to potato virus X were selected using a method essentially similar to that reported in the Iowa section of the 1950 issue of this summary. Seedlings were inoculated in the flat using R. H. Larson's virulent ring spot isolate of potato virus X.[1/] Plants showing necrotic reaction were discarded before transplanting, and seedlings developing symptoms later were removed. After seedlings had recovered from transplanting and were making good growth they were individually inoculated a second time in the greenhouse bench, and susceptible segregates subsequently were removed. It has been shown that virtually all of the susceptible segregates were eliminated by this double

---

1/ The writers wish to express sincere appreciation to Dr. R. H. Larson and his associates of the Wisconsin Agricultural Experiment Station for making the severe ring spot strain of virus X available for this study.

inoculation. Should symptomless carriers of this virus strain later be identified, it seems probable that the numbers will be very low, since over 500 symptomless survivors of various inoculation tests were shown to be free of virus X.

Late Blight

All seedling progenies from Iowa crosses grown in the greenhouse in 1951 had at least one late-blight-resistant parent. As a result, the entire seedling population was exposed to late-blight inoculum in the seedling flats following the methods used in previous years. For these tests the common strain of Phytophthora infestans was used.

Advanced selections believed to be suitable for parents in the breeding program are being tested for resistance to each of the five races of P. infestans identified by Peterson and Mills[2/]. When suitable parent material is available, seedlings will be screened for resistance to other races of the late blight fungus.

Solanum Species

A study has been started on selected solanum species to determine their possible use for incorporating disease resistance into Solanum tuberosum. Selected clones of some of these species reported to be resistant to scab, virus Y, and leaf roll are being tested, as well as serveral that are resistant to late blight. All of the species were planted in the greenhouse during the fall of 1951 to determine their flowering habit and for inter-specific crossability studies. Several F_1 progenies of crosses between different species and S. tuberosum were planted for backcrossing to parent selections. Some demissum x tuberosum and andigenum x tuberosum crosses made at Ames in 1950 were included in this planting.

Wherever possible, enough seed will be produced from the inter-specific crosses to permit screening the material for resistance to late blight in the seedling stage. Selection of disease-resistant clones to be used in further breeding work will then be made from the survivors. Some 18 accessions for use in these studies have been secured as tubers from the Sturgeon Bay Station through the courtesy of Dr. R. W. Hougas.

Chipping Tests

Chipping tests started in the fall of 1950 were completed and the data partially analyzed. Sixty-five varieties and selections grown at Clear Lake, Iowa,

2/ The cooperation of Drs. C. L. Peterson and W. R. Mills of the New York and Pennsylvania Agricultural Experiment Stations, respectively, in making these isolates available is gratefully acknowledged.

were included in these trials. Five replications of each entry were chipped on each of three dates. The first test was made about 1 week after harvest, the second was after 3 months of storage at 40° F. with 2 weeks conditioning at 75° F., and the third was after the same storage treatment with 4 weeks of conditioning at 75° F.

Samples were classified into 5 color grades with class 1 being very light, class 2 light golden brown, class 3 dark but still marketable, class 4 dark, and class 5 very dark. All samples were classified twice by each of 4 individuals. Ratings were surprisingly uniform among different judges, and each of the judges was quite consistent. Color ratings for 20 of the 65 entries are included in Iowa table 1. The values are means of 5 replications and are based on 8 separate ratings of each sample.

Iowa table 1. Color rating of potato chips Ames, Iowa 1950-51.

Entry No.	Variety or pedigree No.	Treatment		
		1 week after harvest	40° F. - 3 mo. 75° F. - 2 wks	40°F. - 3 mo. 75°F. - 4 wks.
2	Pontiac	3.8	4.1	3.6
5	Green Mountain	2.9	3.8	3.2
6	Russet Rural	1.5	2.9	2.6
8	Chippewa	2.1	3.3	2.9
9	Progress	2.7	3.9	3.8
18	Cobbler	2.2	3.5	3.0
19	Triumph	2.3	4.1	3.9
20	Teton	1.9	3.9	3.2
22	Katahdin	1.8	3.5	2.8
25	R. Burbank	2.5	3.2	2.9
26.	Satapa	2.4	3.8	2.9
29	White Cloud	1.6	3.7	3.1
32	Red McClure	2.4	3.8	3.9
33	Sebago	2.3	3.9	3.6
38	White Rose	2.6	4.0	2.9
41	I 8169-8	1.6	4.1	3.9
46	I 8168-26	2.0	4.3	4.0
47	I 8168-10	1.5	4.2	4.0
52	I 874-2	1.1	3.1	2.7
63	I 8140-1	1.4	3.7	2.8

Among the named varieties, Russet Rural was outstanding. White Cloud was equal to Russet Rural at harvesttime but it conditioned a little more slowly. Pontiac, Triumph, Progress, Red McClure, and Sebago were slow to condition after storage. Of the 40 numbered selections tested, the 5 listed in Iowa

table 1 were equal to Russet Rural in quality when chipped soon after harvest. Only 2 of the 5 listed (entries 52 and 63) approached Russet Rural in their ability to recondition. Three of the five numbered selections, entries 41, 46 and 47, produced chips of superior quality at harvesttime but were very difficult to recondition after storage. These results would indicate that in selecting for chipping quality the ability to recondition after storage is most important, and selections cannot be based on tests made immediately after harvest.

LOUISIANA

John C. Noonan, Raymond E. Webb, and Julian C. Miller [1/]

During the fall of 1950 approximately 10,000 seedlings were grown in the greenhouse at Baton Rouge. Selections were made at harvesttime primarily on the basis of color and shape, selecting the seedlings having dark red color and the smooth, solid white ones. The remaining seedlings were discarded. The selected seedlings were divided into two lots. One lot was sent to Clark, S. Dak., and the second lot was sent to Crossville, Tenn., for production and further selection. Out of these two lots the best lines were selected in South Dakota and Tennessee for further trials. This process is kept up each year. After the seedlings are grown at these two locations, they are reselected in August and September at harvesttime, and samples are set aside for planting in these areas, as well as in Louisiana, and another sample for making dry-weight determinations.

We have on hand at the present 336 first-year seedlings, 52 second-year seedlings, 45 third-year seedlings, and 15 fourth-year seedlings. As soon as seed stocks have been built up to a sufficient quantity, the advanced seedlings are placed in preliminary yield tests where they remain at least for 2 to 3 years, and after they pass the preliminary yield tests and tests for other characters, they are placed in advanced yield tests along with standard varieties.

Efforts are being made primarily to breed varieties that are resistant to the diseases scab and late blight, as well as for quality and high yielding ability. Seedlings that we are not able to test for late blight the first year are tested the second season under controlled conditions in the greenhouse, as outlined in Dr. Dykstra's report.

Table 1 shows the dry-weight determinations of some promising seedlings. One of the purposes of our breeding program is to select varieties having high total solids. From the table it will be noted that there is quite a variation in this regard.

It will be noted from La. table 2 that several seedlings produced higher yields than did LaSoda, particularly LD 81-99 and LD 81-64; however, both of these have white skin. The best red seedling was LD 82-266, which was followed closely by LD 82-257 and LD 82-269.

1/ The work at this station is in close cooperation with Dr. T. P. Dykstra, Senior Pathologist, U.S. Department of Agriculture, who is stationed here.

Louisiana table 1. Dry weights from tubers grown in South Dakota - 1951.

Seedling	Dry matter	Starch Content
	Pct.	Pct.
Kennebec (control)	19.4	13.6
LD 82-21 1/	16.3	10.5
LD 81-64	21.6	15.8
LD 81-79	19.9	14.1
LD 81-113	21.8	16.0
LD 81-115	19.7	14.0
LD 81-122	21.0	15.0
LD 81-127	20.8	14.9
LD 81-188	17.4	11.5
LD 81-197	21.1	15.0
LD 82-265	15.9	10.1
LD 82-269	23.1	17.3
LD 91-7	22.3	16.5
LD 91-10	18.5	12.7
LD 92-23	19.0	13.3
LD 92-27	17.3	11.5
LD 91-78	20.5	14.8
LD 91-88	19.9	14.1
LD 92-100	20.2	14.3
LD 92-102	19.6	13.9
LD 92-105	20.8	14.9
LD 92-114	22.6	16.8
LD 91-143	19.5	13.8
LD 92-214	20.8	14.9
LD 92-218	20.3	14.5
LD 92-232	20.0	14.2
LD 91-258	19.5	13.8
LD 92-271	17.4	11.6

1/ In the seedling numbers, the LD signifies Louisiana-South Dakota; the first numerals (8 and 9) represent the year the seedling was first grown; while the second numerals (1 and 2) are for white and red color, respectively. The numerals after the dash are the selection numbers.

Louisiana table 2. Preliminary yield test, Baton Rouge, La.

Seedling	Parentage	Color	Ave. yield per acre	Dry matter	Starch content
			Bu.	Pct.	Pct.
LD 82-15	L 36 x Triumph	Red	108.5	17.50	11.7
LD 82-21	L 36 x DeSoto	Red	113.1	15.90	10.0
LD 82-22	L 36 x DeSoto	Red	66.4	16.60	10.8
LD 82-32	(LaMex#5 x T-3-1#1) x Pontiac	Red	80.2	18.00	12.2
LD 81-64	C x T(3-1) 3-40-3 x 1153	White	158.9	21.60	15.8
LD 81-68	C x T(3-1) 3-40-3 x 1153	White	71.9	19.55	13.7
LD 82-94	X 590-7 x Cayuga	Red	96.1	17.70	11.9
LD 81-99	Green Mountain x B 76-23	White	172.6	19.90	14.1
LD 81-107	B 61-3 x B 76-23	White	62.7		
LD 81-113	B 76-23 x Katahdin	White	112.2	21.80	16.0
LaSoda	Triumph x Katahdin	Red	124.6	16.70	10.9
LD 81-122	B 76-23 x Katahdin	White	132.8	20.80	15.0
LD 81-137	B 76-23 x Katahdin	White	120.5		
LD 81-142	B 76-23 x Katahdin	White	121.4		
LD 81-197	B 76-23 x 1361-3	White	132.8	21.10	15.3
LD 82-257	(Pontiac x Triumph) x 56-1	Red	139.7	15.90	10.0
LD 82-266	Pontiac x 15 (X)	Red	146.5		
LD 82-269	17-6-26 x 179-26	Red	138.3	22.30	16.5
LD 81-275	4/156 x Yellow Flesh	White	45.8	20.00	14.2
LD 81-115	B 76-23 x Katahdin	White	105.0	19.70	14.0
	L.S.D. at 5% level		38.4		
	L.S.D. at 1% level		50.8		

Four 40-foot replications; planted February 23, 1951; harvested June 29, 1951.

Four seedlings were placed in the advanced yield test and planted at one of the major Irish potato areas near New Roads, La. However, most of these seedlings produced yields significantly below that of LaSoda. Seedling LD 82-94 was higher but not significantly. (La.table 3)

Louisiana table 3. Advanced seedling yield test, New Roads, La.

Seedling	Parentage	Color	Ave.yield per acre	Dry weight	Starch content
			Bu.	Pct.	Pct.
LD 82-21	L 36 x DeSoto	Red	208	15.90	10.0
LD 82-32	(LaMex#5 x 7-3-1#1) x Pontiac	Red	173	17.20	11.4
LD 81-64	C x T (3-1) 3-40-3 x 1153	White	217	19.80	14.1
LD 82-94	X 590-7 x Cayuga	Red	264	17.00	11.3
LaSoda	Triumph x Katahdin	Red	250	17.00	11.3
	L.S.D. at 5% level		33		
	L.S.D. at 1% level		47		

Three 40-foot replications; planted February 24, 1951; harvested May 31, 1951.

It will be noted from La. table 4 that there is a marked difference as to yielding ability of the different varieties when grown at the same location, as well as the effect of different dormant periods upon the yielding ability of these different varieties.

Louisiana table 4. Source of seed variety trial, Baton Rouge, La.

Variety	Source	Dormant period	Average yield per acre
			Bu.
LaSoda	Northern-grown	4½ months	203.8
DeSoto		(Held at approx. 40°F.)	204.9
Triumph			79.0
LD 81-70			100.7
LaSoda	Tennessee-grown	5½ months	171.8
Kennebec		(Held at 40°F.)	200.3
LaSoda	Louisiana spring-grown	9 months	50.3
DeSoto		(Held at 40°F.)	112.2
Triumph			83.6
Kennebec			185.5
Katahdin			175.2
LD 82-257			154.6
LaSoda	Louisiana fall-grown	2½ months	171.8
DeSoto		(Held at 75°F.)	148.9
Triumph			154.6
Kennebec			87.0
Katahdin			103.0
LaSalle			146.5
	L.S.D. at 5% level	14.7 bushels	
	L.S.D. at 1% level	19.2 bushels	

Four 40-foot replications; planted February 23, 1951; harvested May 23, 1951

It will be noted also that the Louisiana fall-grown potatoes were only harvested for a period of 2½ months before being planted but were held at a temperature of 75°F., which hastened their rest period and therefore this particular lot of seed produced yields comparable to those of northern-grown seed.

Unfortunately, we could not get comparable seed of all varieties for all treatments. While the seed of the Triumph variety was certified northern-grown stock, I would not class this particular lot as satisfactory certified seed.

Louisiana table 5 shows the yield responses of the varieties to different locations of this State. Diamond is in the southern part; Hammond, Baton Rouge, and New Roads are in the eastern and south-central parts; and Calhoun and Chase are in the northern part. It is of interest to note that LaSoda, DeSoto, and Kennebec seemed to be generally the highest yielders.

Louisiana table 5. Effect of location on yields of varieties in Louisiana.

Variety	Location and average yield per acre						
	Diamond		Hammond	Baton Rouge	New Roads	Calhoun	Chase
	Planting dates 1951 1/						
	1/26	2/8	2/12	2/21	2/24	3/20	3/21
	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.
LaSoda	276.3	262.7	127.1	203.8	251.0	137.0	129.1
Triumph	190.3	176.7	84.5	79.0	111.0	58.2	48.1
DeSoto	267.3	249.2	73.4	204.9	243.0	82.3	73.3
Kennebec	258.2	203.9	72.4	200.3	191.0	84.0	94.3
73-10	226.5	240.0	64.8	115.0	----	----	----
LD 82-265	----	-----	55.4	78.0	99.0	34.2	84.3
LD 82-22	----	-----	-----	66.4	165.0	50.9	76.0
LSD at 5% level	24.2	23.9	21.3	38.4	20.0	35.5	23.6
LSD at 1% level	35.7	35.6	30.4	50.8	27.0	48.4	32.6

1/ Plantings harvested 90 days after planting date. Four 40-foot replications.

Louisiana table 6 gives the 2-year averages of the standard varieties shown in La. table 5. It will be noted that the LaSoda and DeSoto produced yields significantly higher than that of Triumph and even somewhat higher than that of the Kennebec.

La. table 6. Combined data of Irish potato varieties and seedlings, 2-year average - 1950 and 1951.

Variety	Location and yield of U.S. #1's per acre					
	Diamond		Hammond	Baton Rouge	New Roads	Calhoun
	Planted					
	Jan.	Feb.	Feb.	Feb.	Feb.	March
	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.
LaSoda	200.8	211.3	178.2	201.9	256.7	142.4
Triumph	116.1	130.6	148.1	112.5	155.7	82.8
DeSoto	184.5	214.1	150.0	208.9	256.9	125.1
Kennebec	180.4	185.1	134.5	189.2	228.7	103.6
73-10	158.2	181.3	----	----	----	----

MAINE

Donald Folsom

Relationship of Insect Counts to Leaf Roll Spread in Resistance Test at Highmoor Farm, 1939-1950

In each of the 12 years, 1939 to 1950, every third row was planted with Chippewa stock running from 77 to 100 percent leaf roll. The other rows were planted with healthy Chippewa, Green Mountain, or Katahdin, or with seedlings that either were new to the test or had shown little or no leaf roll in the test the preceding year. Planting was done May 2 to 5 to May 20 to 25, usually by May 14, except in one wet year when it was done June 7 to 13. Counts were made of the aphids on 5 leaves per plant at top, near top, at middle, near base, and at base of plant, for 10 plants per row, in 2 or more leaf roll Chippewa rows. Abundance of any other kind of insect was noted.

The spread of leaf roll in each year was not apparent until the following year in the replanted lots. The average leaf roll spread was:

Chippewa	91%,	in 10 years	(varied from 77 to 100%)
Green Mountain	75%,	in 12 years	(varied from 24 to 99%)
Katahdin	57%,	in 4 years	(varied from 47 to 78%)
New seedlings	75%,	in 10 years	(% of seedlings infected) (varied from 41 to 93%)
X1276-185,	19%,	in 8 years	(varied from 0 to 75%)
B 24-58	7%,	in 8 years	(varied from 0 to 44%)

In 2 years there was more leaf roll spread than usual, and in 1 year there was somewhat less leaf roll spread than usual, but there was a comparatively high aphid count in all 3 years: Maxima of 2282, 4026, and 3200, respectively, per 50 leaves. There was only one other year of high aphid count: Maximum 2553. In 7 years of abundant flea beetles (Epitrix cucumeris), leaf roll spread more than usual in one instance, when the aphid count also was high. Tarnished plant bugs (Lygus oblineatus) were abundant in one year and leaf hoppers (Empoasca fabae) in another year, but leaf roll spread was not unusually high in either year. The aphid count was very low in 1949, maximum 87, but the leaf roll spread was normal; flea beetles were abundant.

While the location apparently was favorable for testing field resistance to leaf roll, there seems to be no clear-cut correlation between the abundance of certain kinds of insects and the few departures of leaf roll spread from the norm.

MAINE

Donald Folsom

Leaf Roll Resistance, 1951, at Highmoor Farm

In 1950 the usual procedure of planting every third row with leaf roll Chippewa was followed in the field test on Highmoor Farm in southwestern Maine. The aphid count was the highest ever, and the test was unusually severe according to the 1951 leaf roll readings. These were 99, 98, and 78 percent, respectively, for Green Mountain, Chippewa, and Katahdin, and 13 percent for seedling B 24-58, usually field-immune.

In 1950, each of the three standard varieties was grown alongside the strip of seedling varieties on both sides, in two rows about 100 feet apart. The readings in 1951 were as follows for the two locations in the field.

Green Mountain,	quartered	tubers,	east	side	99%,	west	side	100%
" "	small	"	"	"	99%	"	"	98%
Chippewa,	field-run	"	"	"	98%	"	"	98%
Katahdin,	quartered	"	"	"	80%	"	"	79%
"	small	"	"	"	75%	"	"	74%

This year another comparison was made between plantings by 4-hill units, planted from tubers of about 6 ounces and larger; 2-hill units, planted from tubers of about 3 to 6 ounces; and uncut tubers, 2 to 3 ounces. The results are given in Folsom table 1. The percentage of leaf roll was higher in 4-hill units than in 2-hill units in 5 out of 8 instances; in 2-hill units than in hills from uncut tubers in 8 out of 13 instances; in 4-hill units than in hills from uncut tubers in 3 out of 4 instances; and, to summarize, in larger than in smaller units in 16 out of 25 instances. Thus, as in 1950, there was a tendency for larger tubers in the same lot to have more leaf roll than smaller ones had.

Observations were made on the various seedlings on June 18, June 26, July 2, July 11, and later. Final maximum leaf roll readings were reached in 2, 11, 20, and 7 seedlings, respectively, on the 4 dates given.

Of 2,022 seedlings introduced to the Highmoor Farm field test in 1944 from Beltsville, one (B 514-14) was left in 1951 and was yield-tested in 5 places. It will be discarded because of insufficient yields, variability of tuber type, germination in storage at temperatures low enough to inhibit germination of standard varieties, and insufficient cooking quality.

Of 1,563 seedlings introduced in 1945 from Beltsville, one (B 579-195) was left in 1951 and was yield-tested in 5 places. It will be discarded because of insufficient yields, tenderness of vines to hail and to cultivation operations, and insufficient cooking quality.

Folsom table 1. Percentages of leaf roll in different tuber-size classes in standard and seedling varieties.

Variety or seedling (and part)	Leaf roll percentage				Total hills
	4-hill tuber units	2-hill tuber units	Hills from uncut tubers	All hills	
	Pct.	Pct.	Pct.	Pct.	
G.M. (E)	99		99	99.0	977
G.M. (W)	100		98	99.6	997
Kat. (E)	80		75	79.0	958
Kat. (W)	79		74	78.0	972
Pontiac	95	80		92.0	200
X1276-185	75	20		27.0	160
B 514-14(-X)	6	9		8.0	692
B 514-14(X)	39	24		24.1	3546
B 579-195	34	37		36.0	1004
B 751-119	2	10		10.0	1060
B 786-87	10	7		9.0	1172
B 577-132(-X)	0	0		.0	158
B 577-132(X)	0	0		.0	528
B 583-66		17	34	30.0	259
B 583-67(-X)		18	27	23.0	334
B 583-67(X)		11	18	16.0	468
B 859-5		0.5	0	.4	529
B 859-10		7	9	8.0	404
B 784-53		10	1	6.0	212
B 2155-22		88	67	78.0	64
B 2155-80		70	47	59.0	140
B 2165-18		50	43	45.0	87
B 2187-25		0	12	10.0	70
B 2187-112		11	8	10.0	104
B 2187-116		30	28	29.0	80
B 2091-35	89	80		88.0	32
B 2113-16		20	17	18.0	85

Of 1,563 seedlings introduced in 1945 from Beltsville, one (B 579-195) was left in 1951 and was yield-tested in 5 places. It will be discarded because of insufficient yields, tenderness of vines to hail and to cultivation operations, and insufficient cooking quality.

Of 1,559 seedlings introduced in 1946 from Beltsville, 4 have been kept for 1952. One of these (B 789-388, parents X1276-185 and B 61-3) is resistant to late blight, has large vines, yields about like Katahdin, and is better than Katanhdin cooked.

Of 360 seedlings introduced in 1947 from Beltsville, the last one left was discarded because of low yield.

Of 1,416 seedlings introduced in 1948 from Beltsville, 3 are still on hand, and 14 were discarded, 10 on account of too much leaf roll, 2 for poor vines, and 2 because of low yield.

Of seedlings introduced to Highmoor Farm 1947-1950 from the aphid-transmission test at Aroostook Farm, four are still on hand and six were discarded; four on account of too much leaf roll, one because of low yield and small tubers, and one for small vines and low yield.

MAINE

Donald Folsom and Donald Merriam

Yield Test of Leaf Roll Resistant Seedlings at Aroostook Farm 1951

In 1950, 26 seedlings grown at Highmoor Farm and 13 grown at Aroostook Farm were considered worth testing for yield on Aroostook farm in 1951. One to 10 plots were planted to represent each seedling, depending on the amount of seed available. The seedling plots were interspersed with plots of Katahdin, Chippewa, and Green Mountain, 49 plots per variety, which yielded respectively 542, 623, and 698 bushels an acre. The harvested tubers of all plots were examined for tuber type and size. Green Mountain tubers varied more in type than tubers of the other two standard varieties. About half of the seedlings yielded at least 90 percent as much as Katahdin. Of these, 7 yielded as much or more. In these 7, 2 probably will be tested in several places in 1952, 1 has inferior cooking quality, 2 have tubers of poor type, and the other 2 will be increased and tested further. One seedling yielded 97 percent as much as Katahdin, has large vines, is resistant to late blight in Dr. Schultz's test, and is somewhat better than Katahdin when cooked. This one also will be increased and tested further.

MAINE

G. W. Simpson and Reiner Bonde

Leaf Roll Resistant Seedlings

Testing for resistance to leaf roll was continued at Presque Isle for the eighth season. In 1951 there were 7,207 new seedlings from 22 crosses added to the test. In addition, all survivors from 1947 on were retested in single-hill lots. Two hundred seventy-eight selected hills from 11 crosses previously introduced at the Chapman farm were planted in 5-hill lots. In this section of the plot, all 5 hills were infested with green peach aphids. Twenty-four selections representing 7 crosses failed to show current-season symptoms of leaf roll.

Of the newly introduced seedlings, 207 or 2.9 percent failed to show current-season symptoms of leaf roll.

Seedlings surviving several tests usually come from crosses involving Imperia or Kepplestone Kidney (Maine tables 1, 2, and 3). In fact, all crosses listed in the three tables, except B 877 and B 2449, have one or both in their parentage. In Maine table 4 it is interesting that all six crosses showing 10 percent survival or better, also have one or both in their parentage.

Maine table 1. Reaction of progenies of different crosses to leaf roll infection resulting from artificial inoculations with viruliferous green peach aphids in each of five successive seasons, 1947-1951.

Pedigree	Parentage	Seedlings planted 1947[1]	Replanted				Saved for retesting
			1951	1950	1949	1948	
		No.	No.	No.	No.	No.	No.
B 801	Dakota Red x X247-44	356	2	4	9	46	1
B 808	B 24-78 x X247-24	415	21	34	61	88	11
B 872	B 24-76 x B 24-238	479	12	29	57	80	5
B 876	X1276-179 x X247-48	681	6	16	44	76	2
B 877	X1276-185 x Katahdin	220	1	2	9	21	1

[1] 37 crosses were included in the 1947 introductions. The other 32 crosses have been eliminated.

Maine table 2. Reaction of progenies of different crosses to leaf roll infection resulting from artificial inoculations with viruliferous green peach aphids in each of four successive seasons, 1948 - 1951.

Pedigree	Parentage	Seedlings planted 1948 1/	Replanted			Saved for retesting
			1951	1950	1949	
		No.	No.	No.	No.	No.
B 2081	Green Mountain x X247-48	264	2	9	18	1

1/ 43 Crosses were introduced in 1948. The others have been eliminated.

Maine table 3. Reaction of progenies of different crosses and selfed lines to leaf roll infection resulting from artificial inoculations with viruliferous green peach aphids in each of three successive seasons, 1949 - 1951.

Pedigree	Parentage	Seedlings planted 1949 1/	Replanted		Saved for retesting	
			1951	1950		
		No.	No	No.	No	Pct.
B 1221	B 24-78 selfed	150	24	35	15	10.0
B 2351	Houma x B 582-33	82	3	9	1	1.2
B 2353	WSC17 x B 1122-25	105	18	26	9	8.6
B 2354	B 24-78 x B582-33	80	8	17	5	6.3
B 2357	B 582-66 x B 584-11	156	23	68	10	6.4
B 2359	B 1122-25 x B 24-78	331	64	101	41	12.4
B 2360	B 1122-25 x B 584-11	168	11	29	4	2.4
B 2362	B 1122-25 x X 1276-185	48	6	10	1	2.1
B 2364	X1276-185 x B 1122-25	55	7	11	2	3.6
B 2366	X 1276-185 x B 582-33	50	10	14	1	2.0
B 2378	B 583-66 x B 582-33	144	23	31	9	6.3
B 2381	B 673-76 x B 1122-25	162	9	14	1	.6
B 2382	B 673-76 x X1276-185	155	9	24	1	.6
B 2449	Houma x Netted Gem Mutant	381	11	100	2	.5

1/ 36 Crosses were introduced in 1949. The others have been eliminated.

Maine table 4. Reaction of progenies of different crosses and a selfed line to leaf roll infection resulting from artificial inoculation with viruliferous green peach aphids in each of two successive seasons, 1950 - 1951.

Pedigree	Parentage	Seedlings planted 1950 1/	Replanted 1951		Surviving a second inoculation in 1951 and saved	
		No.	No.	Pct.	No.	Pct.
B 1269	Placid selfed	88	4	4.5	0	0.0
B 1311	X1241-91 selfed	82	4	4.9	0	.0
B 2834	B 294-38 x X157-9	230	54	23.5	6	2.6
B 2835	B 294-38 x X528-170	226	24	10.6	4	1.8
B 2860	B 899-48 x Aquila	59	8	13.6	0	.0
B 2904	B 301-29 x B 61-3	161	2	1.2	0	.0
B 2905	B 301-29 x B 355-35	152	3	2.0	0	.0
B 2925	X1276-185 x B 76-23	275	49	17.8	17	6.2
B 2926	X1276-185 x B 355-44	289	43	14.9	13	4.5
B 2929	Empire x B 1153-10	199	8	4.0	0	.0
B 2931	Empire x B 872-70	107	20	18.7	11	1.0
B 2930	Empire x B 929-6	122	4	3.3	1	.8
B 2932	Kennebec x B 872-70	24	6	25.0	2	8.0
B 2933	B 779-1 x Aquila	169	7	4.1	0	.0
B 2937	Virgil x B 522-33	102	13	12.8	3	2.9
B 2938	B 355-44 x B 522-33	416	34	8.2	1	.2
B 2939	B 583-66 x B 582-33	190	88	46.3	37	19.5
B 2940	B 584-11 x B 1122-25	44	15	34.1	3	6.8
B 2941	B 673-76 x B 1122-25	224	76	33.9	25	11.2
B 2942	X1276-185 x B 355-24	82	8	9.8	0	.0
B 2943	Aquila x Triumf	28	2	7.1	1	3.6
B 2945	Houma x Aquila	172	26	15.1	4	2.3
B 2946	Houma x Triumf	71	13	18.3	6	8.5
B 2947	Katahdin x Triumf	104	7	6.7	2	1.9
B 2948	Katahdin x B 578-39	36	4	11.1	1	2.8
B 2949	B 420-174 x Triumf	204	39	19.1	13	6.4
B 2950	B 420-186 x Katahdin	70	1	1.4	0	.0
B 2951	B 420-186 x Triumf	44	4	9.1	0	.0
B 2952	B 514-14 x Katahdin	130	9	6.9	4	3.1
B 2953	B 514-14 x B 446-8	261	7	2.7	3	1.2
B 2954	B 514-14 x B 578-39	207	28	13.5	12	5.8
B 2955	B 572-92 x Katahdin	223	11	4.9	0	.0
B 2956	B 572-92 x B 778-43	64	1	1.6	1	1.6
B 2958	B 583-66 x B 986-7	212	83	39.2	52	24.5
B 2959	B 583-67 x B 572-70	172	41	23.8	16	9.3
B 2960	B 864-17 x Aquila	240	14	5.8	3	1.3
B 2963	B 876-63 x Aquila	384	15	3.9	1	.3

Maine table 4 continued

Pedigree	Parentage	Seedlings planted 1950 1/	Replicated 1951		Surviving a second inoculation in 1951 and saved	
		No.	No.	Pct.	No.	Pct.
B 2964	B 876-63 x B 872-70	68	5	7.4	2	2.9
B 2965	B 876-63 x B 986-7	283	28	9.9	11	3.9
B 2967	B 927-3 x B 878-28	86	4	4.7	2	2.3
B 2971	B 574-14 x B 872-70	230	36	15.7	18	7.8
B 2973	Aquila x B 878-28	46	4	8.7	0	.0
B 2975	B 577-132 x B 962-32	192	5	2.6	0	.0
B 2976	B 583-66 x B 872-70	292	71	24.3	57	19.5
B 2977	B 583-67 x B 578-39	179	52	29.1	28	15.6
B 2979	B 778-43 x B 578-39	55	1	0.5	0	.0
B 2980	B 606-3 x B 986-7	83	2	2.4	0	.0
B 2981	B 864-2 x Triumf	46	5	10.9	1	2.2
B 2982	B 864-2 x B 929-6	76	5	6.6	1	1.3
B 2983	B 864-17 x B 986-7	78	26	33.3	9	15.4
B 2984	B 872-70 x B 962-32	87	3	3.5	2	2.3
B 3016	B 478-1 x B 582-33	153	15	9.8	1	.7
B 3022	B 724-1 x Ruska	183	7	3.8	1	.6
B 3024	B 724-20 x B 872-70	94	5	5.3	3	3.2
B 3037	Empire x B 355-35	35	1	2.9	0	.0
B 3038	Empire x B 355-44	240	7	2.9	1	.4
B 3025	B 864-2 x B 724-1	132	4	3.0	0	.0
B 3039	Empire x B 434-91	187	15	8.0	2	.7
B 3044	B 294-22 x B 355-44	319	6	1.9	0	.0
B 3045	B 294-22 x B 522-33	247	35	14.2	4	1.6

1/ In addition 5 crosses were planted in 1950 but eliminated in that year because all plants showed current-season symptoms of leaf roll.

Maine table 5. Reaction of progenies of different crosses and selfed lines to leaf roll infection resulting from artificial inoculation with viruliferous green peach aphids in 1951.

Pedigree	Parentage	Seedlings planted 1951	Saved for retesting 1952	Surviving the first year's test
Selected progenies planted in 5-hill lots -- not first-generation tubers.		No.	No.	Pct.
B 2897	Kennebec x B 522-33	34	2	5.9
B 2935	B 929-6 x T15	6	0	.0
B 2944	Chippewa x B 514-14	65	8	12.3
B 2962	B 872-70 x B 983-9	9	3	33.3
B 2966	B 922-6 x Aquila	25	1	4.0
B 2968	B 962-32 x B 420-186	72	6	8.3
B 2969	B 1153-10 x B 878-28	24	1	4.2
B 2972	B 574-14 x B 929-6	34	3	8.8
B 2978	B 673-76 x B 721-29	4	0	.0
B 2989	B 572-92 x B 446-8	4	0	.0
B 3029	B 724-15 x B 872-70	1	0	.0
Unselected progenies planted in single-hill lots with first-generation tubers.				
B 1339	B 514-14 selfed	63	17	27.0
B 1350	B 936-12 selfed	530	2	.4
B 3095	Houma x Triumf	713	46	6.5
B 3096	Houma x B 572-92	211	12	5.7
B 3115	B 514-14 x Triumf	595	35	5.9
B 3118	B 572-92 x B 446-8	378	8	2.1
B 3119	B 583-66 x B 578-39	355	18	5.1
B 3120	B 583-66 x B 778-43	134	12	9.0
B 3121	B 583-67 x B 721-29	370	6	1.7
B 3129	B 606-3 x B 986-7	269	1	.4
B 3146	B 724-15 x B 872-70	169	9	5.3
B 3152	B 864-17 x B 983-9	555	7	1.3
B 3155	B 876-63 x B 983-9	506	8	1.6
B 3165	X927-3 x B 721-30	204	0	.0
B 3174	B 983-9 x Aquila	234	5	2.1
B 3187	B 1122-25 x B 607-56	125	2	1.6
B 3189	Essex x Menominee	291	1	.3
B 3195	B 754-16 x Menominee	256	6	2.3
B 3198	B2091-35 x Menominee	184	4	2.2
B 3203	B 922-3 x B 936-12	622	1	.2
B 3205	X927-3 x B 754-16	127	4	3.2
B 3206	X 927-3 x B 936-12	316	3	1.0

MAINE

G. L. Terman and R. V. Akeley[1/]

Potato variety trials were continued in 1951 in Maine at four locations: Dover-Foxcroft, Exeter, Presque Isle, and Sherman Mills. These trials are conducted each year to determine how different varieties react under growing conditions prevailing in various parts of the State.

Seven named and nine unnamed new varieties were included in the 1951 trials. Characteristics chiefly responsible for the inclusion of each of the 16 varieties in the trials are shown in Terman table 1. Varieties are arranged in order of descending average yield for the four locations, as shown in Terman table 2. Varieties such as Green Mountain, Irish Cobbler, and Katahdin are included in the trials each year because of their long acceptance as commercial varieties.

Terman table 1. Important characteristics of potato varieties included in 1951 variety trials.

Variety	Disease resistance	Maturity	Eating quality and dry-matter content
B 606-67	Late blight	Mid-season	High
Kennebec	Late blight	Mid-season	High
Pungo	Late blight	Mid-season	High
B 73-10	Late blight	Early	Medium
B 446-8	Late blight, ring rot	Mid season	Low
Green Mountain	None	Very late	Very high
Cherokee	Late blight, common scab	Mid-season	Medium
B 447-98	Late blight, ring rot	Very early	Low
B 355-35	Late blight, ring rot	Late	Medium
Katahdin	None	Mid-season	Medium
B 637-14	Ring rot	Early	Low
Mohawk	None	Late	Very high
Irish Cobbler	None	Very early	Medium
B 579-195	Leaf roll	Early	Low
B 355-44	Late blight, ring rot	Very late	Very high
B 514-14	Leaf roll	Early	Medium

1/ Agronomist, Maine Agricultural Experiment Station, and Horticulturist, U.S. Department of Agriculture. S. C. Junkins, C. E. Cunningham, Michael Goven, and others assisted in the conduct of these tests. Appreciation for cooperation is extended to growers on whose farms the trials were located.

Terman table 2. Total yields and yields of tubers 2 to 4 inches in diameter in 1951 potato variety trials, bushels per acre 1/

Variety	Location and yield per acre										
	Dover-Foxcroft		Exeter		Presque Isle		Sherman Mills		Ave. all locations		
	Total	2-4 in. diam.	Total	2-4 in. diam.	Total	2-4 in. diam.	Total	2-4 in. diam.	Total	2-4 inches	
	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Pct.	Bu.
B 606-67	494	392	580	513	700	629	733	688	627	88.7	556
Kennebec	466	347	628	506	707	655	698	663	625	86.9	543
Pungo	548	472	593	444	618	569	659	545	605	84.0	508
B 73-10	440	379	568	492	674	609	628	596	578	89.8	519
B 446-8	453	378	491	383	669	624	658	623	568	88.4	502
Green Mountain	466	324	460	289 2/	702	619	503	461	533	84.1	448
Cherokee	406	287	497	430	605	551	600	552	527	86.3	455
B 447-98	436	279	442	347	529	450	612	559	505	81.0	409
B 355-35	398	278	492	405	562	495	552	503	501	83.8	420
Katandin	468	394	373	282 2/	638	568	477	444	489	86.3	422
B 637-14	551	474	379	289 2/	588	537	407	382	481	87.5	421
Mohawk	432	424	354	261 2/	615	577	453	429	464	91.1	423
Irish Cobbler	409	272	315	217 2/	529	418	502	439	439	76.8	337
B 579-195	404	342	300	201 2/	557	503	486	464	437	86.5	378
B 355-44	256	200	452	385	536	489	461	416	426	87.6	373
B 514-14	336	167	244	138 2/	558	450	420	349	390	70.8	276
L.S.D., 5% level	76	96	90	83	58	57	85	92	38	--	--
1% level	104	129	120	112	78	77	113	123	50	--	--
Ave. all varieties	435	338	448	355	612	546	553	507	512	85.0	437

1/ Yields of susceptible varieties were greatly reduced by late blight tuber rot at Exeter and Sherman Mills. Verticillium wilt was chiefly responsible for low yields at Dover-Foxcroft.

2/ Calculated yields, since these varieties were not graded because of late blight tuber rot.

At all locations 2,500 pounds of 5-10-10 fertilizer was applied per acre in row side-bands. Seed pieces were spaced at 9 inches in rows 34 inches apart. Varieties were arranged in 40-foot rows in randomized blocks with 4 replications at each location.

Total Yields

In Terman table 2, varieties are arranged in order of descending average-total or field-run yields for the 4 locations. Average yields of tubers 2 to 4 inches in diameter, as well as the percentages of this size range of the total yields, are also shown.

In 1951 late blight was the most important factor affecting potato yields in these trials, as well as in commercial fields. Late blight was most severe at Exeter and Sherman Mills, but was well controlled at Presque Isle. Verticillium wilt was chiefly responsible for low yields at Dover-Foxcroft. Rainfall was adequate at all locations.

All of the 5 highest-yielding varieties were resistant to late blight, as were 8 out of the leading 10 varieties. Only the non-resistant Green Mountain and Katahdin varieties produced total yields falling in the first 10.

Relation Between Yields of 2- to 4-inch Tubers and Total Yields

The 5 varieties producing the highest total yields also produced the highest yields of potatoes 2 to 4 inches in diameter. This is the size range into which most potatoes for table use are graded. Yields of 2- to 4-inch tubers were lower than the total for high-yielding varieties, chiefly because of over-size tubers. This was particularly true of Kennebec, Pungo, B 606-67, and B 73-10, which had appreciable numbers of tubers over 4 inches in size. Most of these tubers had hollow heart and hence were unsalable for table use. This indicates that these varieties should be planted closer than the 9-inch seed-piece spacing used in these trials. In the lower-yielding varieties, 2- to 4-inch yields were lower than the total yield because of tubers below 2 inches in size. These low yields resulted largely from disease.

The relationship between total and 2- to 4-inch yields of tubers was very close for the 16 varieties and 4 locations. Mathematically speaking, the correlation coefficient was 0.96. The relationship may be expressed in these trials by:

Yield of tubers 2 to 4 inches in size = 1.115 x total yield - 134.

Specific Gravity

An increase in specific gravity of potato tubers is closely related to increase in starch and dry-matter content. For each 0.005 increase in specific gravity, starch content increases by approximately 1 percent. Mealiness and general eating quality are fairly closely related to specific gravity. Eating quality is thus conveniently measured by specific gravity. In these trials,

Duplicate samples of 15 to 20 uniform size tubers 2 to 2½ inches in diameter from each plot were weighed in air and water to determine the specific gravity values.

Specific gravity values for the various locations are shown in Terman table 3.

Terman table 3. Specific gravity of tubers in 1951 potato variety trials.

Variety	Dover Foxcroft	Exeter	Presque Isle	Sherman Mills	Ave., 1951	5-year ave., 1947-51
Green Mt.	1.078	1.082	1.092	1.077	1.082	1.080
B 355-44	1.076	1.083	1.086	1.074	1.080	---
B 606-67	1.076	1.080	1.082	1.077	1.079	---
Mohawk	1.075	1.077	1.092	1.071	1.079	1.078
Kennebec	1.069	1.074	1.081	1.074	1.074	1.074
Pungo	1.072	1.075	1.077	1.071	1.074	1.076
B 514-14	1.075	1.071	1.078	1.069	1.073	---
Cherokee	1.068	1.073	1.078	1.070	1.072	1.075
Katahdin	1.071	1.069	1.080	1.067	1.072	1.071
B 355-35	1.069	1.074	1.079	1.067	1.072	---
Ir. Cobbler	1.071	1.069	1.075	1.071	1.071	1.074
B 73-10	1.067	1.071	1.076	1.067	1.070	---
B 447-98	1.068	1.071	1.073	1.066	1.069	---
B 579-195	1.068	1.067	1.071	1.066	1.068	---
B 446-8	1.061	1.065	1.074	1.066	1.066	---
B 637-14	1.065	1.064	1.071	1.061	1.065	---
LSD, 5% level	0.003	0.004	0.004	0.004	0.002	---
1% level	0.004	0.005	0.005	0.005	0.002	---
Ave., all varieties	1.071	1.073	1.079	1.070	1.073	---
Date of planting	May 22	May 21	May 10	June 6		
Date of harvest	Sept.22	Oct.18	Sept.15 18	Oct. 3		
Date of sp. gr. determination	Sept.28	Oct.23 25	Nov. 26 30	Oct. 5		

Varieties are arranged in descending order of the average values for all locations. Green Mountain had the highest average of specific gravity and B 637-14, a ring-rot-resistant variety, the lowest. Seven of the 10 highest-yielding varieties were also among the 10 varieties highest in specific gravity. This indicates that progress is being made in combining characteristics of high yield and high quality. High-yielding but low specific-gravity varieties, such as Essex, Ontario, and Teton, were not included in the 1951 trials.

The higher specific gravity values at Presque Isle are thought to be largely due to loss of water from the tubers before gravity determinations were made. Tubers at Presque Isle were stored more than 2 months before determinations were made, while those from other trials were stored less than 1 week. Potato tubers lose water by evaporation rather rapidly just after harvest, and as a result the percentage of dry-matter content and specific gravity rise considerably during the early storage period and much more slowly later in the storage period until sprouts develop.

Numbers of Stems and Tubers

Numbers of stems and tubers produced per hill, or seed piece which produced a plant, were determined in the 1951 variety trials for the first time. Other work has shown that numbers of tubers of a given variety growing to marketable size increase with increase in number of stems per hill. The number of tubers is important, since it determines the size of tubers at any given yield level.

As may be noted in Terman table 4, varieties that produced the most stems per hill also in general produced the most tubers per hill. The low but significant correlation coefficient of 0.41 between numbers of stems and tubers was calculated for the combined data from Dover-Foxcroft, Exeter, and Sherman Mills. For Presque Isle the coefficient was 0.55. There was no appreciable difference in the number of stems per hill between different locations, but numbers of tubers per hill were highest at locations producing the highest yields. This indicates that conditions favorable for high yields allow the development of larger numbers of tubers of marketable size. Size of tubers in a crop of potatoes is thus a function of both numbers of tubers and yield.

Values for tubers per stem in Terman table 4 indicate that potato varieties differ as to the number of tubers that develop from a given number of stems. This is probably due to the marked difference in vine growth and branching characteristics between varieties.

Terman table 4. Numbers of stems and tubers per hill in 1951 potato variety trials.

Variety	Location and stems and tubers per hill								Ave. all locations	Ave. Dover and Presque Isle	
	Dover-Foxcroft		Exeter 1/		Presque Isle		Sherman Mills 1/				
	Stems	Tubers	Stems	tubers	Stems	tubers	Stems	tubers	Stems	Tubers	Tubers per stem
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
B 606-67	3.51	5.76	3.07	4.96	3.04	8.16	2.46	5.45	3.02	6.96	2.30
Kennebec	2.85	4.79	2.41	4.26	2.38	5.56	2.67	4.87	2.58	5.18	2.01
Pungo	2.93	4.78	2.74	3.58	2.47	5.55	2.83	4.08	2.74	5.17	1.89
B 73-10	2.40	4.81	2.36	4.37	2.10	6.61	2.16	5.11	2.26	5.71	2.53
B 446-8	2.05	4.62	2.33	5.47	2.16	6.35	2.09	5.57	2.16	5.49	2.54
Gr. Mountain	3.14	5.28	2.82	---	2.40	8.23	2.49	5.51	2.71	6.76	2.49
Cherokee	2.09	5.00	2.11	4.55	1.88	6.88	2.22	5.42	2.08	5.94	2.86
B 447-98	3.02	6.70	2.82	5.25	2.54	7.29	2.36	6.12	2.69	7.00	2.60
B 355-35	2.16	5.41	1.69	5.09	1.70	6.87	1.99	6.22	1.89	6.14	3.25
Katahdin	2.29	4.16	2.34	--	2.41	8.09	1.93	4.71	2.24	6.13	2.74
B 637-14	2.02	4.15	2.07	--	2.16	5.45	2.06	--	2.08	4.80	2.31
Mohawk	1.90	3.56	1.72	--	1.84	5.95	1.78	4.13	1.81	4.76	2.63
Ir. Cobbler	3.51	5.61	3.22	--	3.48	7.86	3.79	6.30	3.50	6.74	1.93
B 579-195	2.36	4.75	2.29	--	2.30	6.80	2.35	--	2.33	5.78	2.48
B 355-44	2.07	2.95	2.04	3.97	2.08	6.09	2.35	4.99	2.14	4.52	2.11
B 514-14	3.01	5.22	2.89	---	2.83	8.39	2.90	--	2.91	6 81	2.34
L.S.D. 5% level	0.34	0.90	0.32	--	0.27	1.17	0.31	--	0.15	--	--
1% level	0.45	1.22	0.43	--	0.36	1.56	0.42	--	0.20	--	--

1/ Tubers of varieties seriously affected by late blight rot were not counted.

MARYLAND

R. A. Jehle

Project Title: Disease resistance in potatoes with special reference to late blight, scab, and virus diseases.

Objects:
1. To find potato varieties that are more resistant to disease than standard varieties, that yield as well or better, and that have as good or better table and marketing qualities.
2. To find better methods for maintaining seed stocks, producing certified seed, and marketing these new varieties.

Plan of Work: Certified seed of old and new varieties from various sources, and promising seedlings from crosses made for the U.S.D.A. breeding program are obtained. These are planted in test plots in the most important potato-producing areas and are studied to determine their yield and vigor, table stock and marketing qualities, vine characters, and resistance to disease and insect injury. Special attention is given to masking of virus diseases, which frequently make the maintenance of disease-free seed stock very difficult or impossible.

Location:
1. Garrett County at Oakland, where the elevation is more than 2,000 feet.
2. Worcester County at Pocomoke, the center of the Eastern Shore potato-producing area.
3. Wicomico County, Eastern Shore, at the University of Maryland farm near Salisbury, where there are a few commercial growers, but where potatoes are grown mostly for home use.
4. Queen Anne's County, Northern Eastern Shore at Crumptom, where there are few commercial growers, and where potatoes are grown mostly for home use.

Results to Date[1/]

Weather conditions were very favorable for the production of the early potato crop on the Eastern Shore, and yields were considerably above average. For tha late crop on the Eastern Shore, conditions were favorable for potato production only in locations where there were enough showers to keep the soil moist. There was sufficient moisture at the University Farm near Salisbury, and yields were above normal; but at Crumptom, there was practically no rain on the late crop, and yields were very much below normal. At Oakland, Md., there was sufficient rain early in the season, but there was

1/ Unless otherwise stated, all seed used in Maryland potato test plots was grown from rogued tuber-unit seed stock from Garrett County, Maryland.

a prolonged drought during the summer, which reduced yields about 100 bushels per acre. The drought was followed by a rainy period, which resulted in much second growth and many growth cracks in some varieties.

Eastern Shore - Pilchard Farm, Pocomoke, Md.

Early Crop. On March 16, a potato field was planted in 5 randomized replications, each containing 50 plants. The largest yield was obtained from the Marygold 2/ variety with 510 bushels of the U. S. No. 1 potatoes per acre. However, the stand was only 71%, which was the lowest of all varieties tested. (Maryland table 1). Many varieties that are superior to Irish Cobbler in appearance, quality, or disease resistance yielded significantly as well. These included the attractive red LaSoda and Waseca; the scab- and blight-resistant Cherokee; the blight-resistant Kennebec, Essex, and B 73-10; the leaf-roll-resistant 1276-185; and the smooth Katahdin, Canus, and White Cloud. When yields from 13 varieties tested at Pocomoke in 1949, 1950, and 1951 were averaged, Essex (Garrett County and home-grown), Marygold, Katahdin, and Pawnee yielded more than Irish Cobbler; and Kennebec yielded practically the same as Maine-grown Irish Cobbler. Marygold is not popular on some markets on account of its yellow flesh, and Essex and Cherokee are very susceptible to second growth during some seasons. Pawnee is preferable to Irish Cobbler on account of the smoothness and uniformity of the tubers.

Twelve varieties and one seedling were planted on March 15 in five 50-plant replications on sandy soil on the University Farm near Salisbury. Maine Irish Cobbler with 141 bushels of U. S. No. 1 potatoes per acre and Katahdin with 140 bushels yielded significantly 3/ less than Kennebec with 218 bushels, Essex with 208 bushels, and Pontiac with 187 bushels. Marygold, 171 bushels; Sebago, 157 bushels; Yampa, 150 bushels; and home-grown LaSoda, 146 bushels yielded significantly as well. Progress, 96 bushels; Cherokee, 94 bushels; and White Cloud, 72 bushels all yielded significantly less. When yields in 1949, 1950, and 1951 were averaged, Essex and Kennebec gave the largest yields, and Marygold and Sebago yielded more than Katahdin and Irish Cobbler (Maryland table 2).

During the past 3 years, all of the varieties and seedlings that were tested in the sandy soil on the University Farm matured at practically the same time. Vines of Kennebec, Essex, and Sebago remainded green only a few days or a week longer than vines of Irish Cobbler. These varieties yielded more than Irish Cobbler, and the difference was significant with Essex and Kennebec. In the sandy loam soil on the Pilchard Farm at Pocomoke, results were different. Essex and Kennebec matured at least 2 weeks later than Irish Cobbler, and the average yields from Kennebec were only a trifle larger. Although the average yields from Essex were much larger than Irish Cobbler at Pocomoke, as well as at Salisbury, there was much second

---

2/ U. S. No. 1 equivalent, not officially graded.

3/ L.S.D. at 5% level = 32.16 bushels.

Maryland table 1. Yield data in bushels per acre on early potato test plot on farm of Willard T. Pilchard, Pocomoke, Md. There were five 50-plant randomized replications. All seed was grown in Garrett County, Md., unless otherwise stated. Field planted March 16 and harvested July 20.

Variety or seedling number	Average yield per acre			Average stand	U.S. #1 to total
	U. S. #1	Culls	Total		
	Bu.	Bu.	Bu.	Pct.	Pct.
Marygold	510	57	567	72	90
LaSoda	443	79	522	98	85
Katahdin	436	67	503	90	87
White Pontiac	425	97	522	99	81
Cherokee	401	99	500	96	80
Irish Cobbler	401	58	459	98	87
Marygold, home-grown	400	55	455	93	88
Essex	399	101	500	96	80
Pawnee	393	48	441	92	89
Chippewa	393	46	439	81	90
1276-185	392	59	451	96	87
Waseca	392	33	425	98	92
White Cloud	381	65	446	98	85
1276-185, Wic. Co.	375	66	441	97	85
Canus	375	55	430	75	87
Kennebec	365	58	423	90	83
1276-185, Wic. Co. from Spr. tr. Seed	364	53	418	95	87
Irish Cobbler, Wor. Co.	364	45	409	94	89
B 73-10 Maine	359	41	390	97	92
Katahdin, Wic. Co.	329	71	400	93	82
Yampa	326	59	385	92	85
Pungo, Maine	322	50	372	99	87
Cherokee, Wic. Co.	319	71	390	90	82
Kennebec, Wic. Co	318	35	353	98	90
Chisago	281	46	327	74	86
Sebago	242	63	305	92	79
Irish Cobbler, Wic. Co.	241	59	300	98	80
B 355-44, Wic. Co	224	43	267	93	84
B 164-15, Wic. Co	216	60	276	95	78
Irish Cobbler, Wic. Co. from Spr. Tr. Seed	135	66	201	98	67

L.S.D. at 5% point = 58.10 bushels

Maryland table 2. Yield data in bushels per acre on early potato test plot on University Farm, Salisbury, Md. There were five 50-plant randomized replications. All seed grown in Garrett County, Md., unless otherwise stated. Field planted March 15 and harvested July 17.

Variety or seedling number	Average yield per acre 1/			Average stand	U.S. #1 to total
	U.S. #1 2/	Culls	Total		
	Bu.	Bu.	Bu.	Pct.	Pct.
Kennebec	218	28	246	83	89
Essex	208	72	280	98	74
Pontiac	187	67	254	93	74
Marygold	171	25	196	83	87
Sebago	157	51	208	85	75
Yampa	150	40	190	84	79
B 164-15	148	57	205	81	72
LaSoda, home-grown	146	41	187	94	78
Irish Cobbler, Maine	141	40	181	91	78
Katahdin	140	38	178	83	79
Progress	96	64	160	96	60
Cherokee	94	58	152	89	62
White Cloud	72	45	117	82	62

1/ L.S.D. at 5% level = 32.16 bu.

2/ U.S. No. 1 equivalent, not officially graded

growth in 1950 at Pocomoke. No second growth was observed in Essex on the University Farm during the 3 years in which it was tested.

A late-potato test plot was planted on July 18 and 19 on the University Farm at Salisbury in 5 randomized 25-plant replications with 14 varieties and seedlings. Seed planted whole was compared with cut seed because growers sometimes have difficulty in getting good stands from cut seed. However, in 1951, stands from whole and cut seed were about the same, and in most cases, there was no significant difference in yields. Highest yields were obtained from whole Ontario with 338 bushels of U.S. No. 1 potatoes per acre; whole Sebago, 325 bushels; whole Kennebec, 320 bushels; whole Marygold, 318 bushels; cut Kennebec, 318 bushels; but Marygold, 299 bushels; and cut Pontiac, 293 bushels. Two other varieties, cut seedling B 255-44, 273 bushels; and cut Sebago, 265 bushels yielded significantly 4/ more than the old standard Dakota Red variety with 202 bushels. Whole Pontiac, whole and cut Katahdin, whole Progress, whole and cut Yampa, whole and cut Essex, whole and cut 1276-185, cut Pungo, whole and cut Canus, and whole and cut Irish Cobbler, all yielded significantly as well. Only cut seedling CS 3175 and cut White Cloud yielded significantly less. (Maryland table 3)

4/ LSD at 5% level = 32.16 bushels.

Maryland table 3. Yield data in bushels per acre from late-potato test plot on University Farm, Salisbury, Md. From 5 randomized 25-plant replications field planted July 18 and 19 and harvested October 30 and 31. All seed was grown in Garrett County, Md., and kept in home storage until April 1, and then kept in cold storage until planted. Yields based on 100% stand.

Variety or seedling	Average yield per acre 1/			Average stand	U.S. #1 to total
	U.S. #1 2/	Culls	Total		
	Bu.	Bu.	Bu.	Pct.	Pct.
Ontario, whole	338	45	383	86	88
Sebago, whole	325	45	370	99	88
Kennebec, whole	320	41	361	98	89
Marygold, whole	318	59	377	94	84
Kennebec	318	39	357	86	89
Marygold	299	65	364	93	82
Pontiac	293	50	343	78	85
B 355-44	273	49	322	75	85
Sebago	265	45	310	93	85
Pontiac, whole	258	78	336	99	77
Yampa	249	51	300	43	83
Katahdin, whole	249	38	281	98	89
Progress, whole	233	87	320	90	73
Katahdin	229	53	282	72	81
Yampa, whole	226	77	303	99	75
Essex	221	129	350	82	63
Essex, whole	210	111	321	98	65
1276-185, whole	210	94	304	46	69
Pungo	208	96	304	98	68
Dakota Red	202	47	249	94	81
Canus, whole	194	75	269	88	72
Irish Cobbler, whole	193	84	277	100	70
Irish Cobbler	192	91	283	97	68
1276-185	178	62	240	48	74
Canus	176	68	244	45	72
Dakota Red, whole	132	48	180	97	73
CS 3175	119	98	217	100	55
White Cloud	112	88	200	94	56

1/ LSD at 5% level = 55.18 bu.

2/ U.S. No 1 equivalent, not officially graded.

Another late-potato test plot with early grown seed was planted July 19 on the University Farm at Salisbury. The seed of seven varieties and one seedling was dug 2 days prior to planting and the cut seed pieces were soaked 10 minutes in a 3/4% solution of ammonium thiocyanate, to hasten sprouting, and planted immediately. Check plots with similar seed pieces soaked 10 minutes in water were also planted. The largest yield was obtained from treated Marygold seed with 260 bushels per acre of U.S. No. 1 potatoes. The next largest yield was obtained from treated Progress seed with 234 bushels. Treated Waseca yielded 163 bushels; treated Irish Cobbler, 156 bushels, treated SaSoda, 115 bushels; treated White Cloud, 98 bushels; and treated 1276-185, 88 bushels. The Marygold water check yielded 141 bushels, which was significantly 5/ less than the treated Marygold, but significantly as large as the treated Waseca, Irish Cobbler, LaSoda, White Cloud, and 1276-185. All other water checks yielded significantly less than treated plots and some yielded almost no marketable tubers. With varieties tested, our results indicate that the treatment is practical only with Marygold and Progress. (Maryland table 4).

Maryland table 4. Yield in bushels per acre from treated early grown seed on University Farm, Salisbury, Md., from 5 randomized 25-plant replications. Field planted July 18 and 19 and harvested October 30 and 31. Actual yield excepting calculation for rogued plants.

Variety or seedling	Average yield per acre 1/			Average stand	U.S. # 1 to total
	U.S. #1 2/	Culls	Total		
	Bu.	Bu.	Bu.	Pct.	Pct.
Marygold, Amm. Th. 3/	260	23	283	74	92
Progress, Amm. Th.	234	54	288	94	81
Waseca, Amm. Th.	163	46	209	70	78
Irish Cobbler, Amm. Th.	156	42	198	80	79
Marygold, Water	141	22	163	36	87
LaSoda, Amm. Th	115	21	136	50	85
White Cloud, Amm. Th.	98	44	142	70	69
1276-185, Amm. Th.	88	27	115	46	77
Waseca, Water	80	21	101	46	79
Progress, Water	34	18	52	22	65
1276-185, Water	21	7	28	18	75
White Cloud, Water	1	5	6	6	17
Irish Cobbler, Water	1	4	5	3	20
LaSoda, Water	0	1	1	3	0

1/ L.S.D. at 5% level = 70.64 bu.

2/ U.S. No. 1 equivalent, not officially graded.

3/ Soaked 5 minutes in a 3/4% solution of ammonium thiocyanate and planted immediately.

5/ LSD at 5% level = 63.52 bushels.

Twenty-five varieties and three seedlings were planted on March 27 in five 50-plant randomized replications on the farm of Thomas J. McGinnis at Crumptom, Md., Queen Anne's County, and harvested July 30. Mr. McGinnis sells his entire crop at roadside market and grades the tubers into primes and seconds leaving the culls in the field. With the exception of Sebago and Ontario, all of the later-maturing varieties fell within the highest yielding group[6]. Two earlier maturing varieties, Marygold and B 73-10, also fell within this group. Yields in this group were as follows: Kennebec[6], 222 bushels primes per acre; home-grown Pontiac, 217 bushels; Pontiac, 205 bushels; Marygold, 194 bushels; white Pontiac, 193, bushels; red Pontiac, 182 bushels; B 355-44, 167 bushels; and Maine B 73-10, 162 bushels. The remaining varieties tested yielded neither significantly more nor significantly less than Maine Irish Cobbler with 105 bushels primes per acre. The highest-yielding variety in this group was Waseca with 156 bushels primes per acre. Others yielding over 100 bushels were Canus, 146; home-grown Marygold, 146; LaSoda, 140; Satapa, 135; Yampa, 132; home-grown Sebago, 124; Katahdin, 120; Pawnee, 112; White Cloud, 111; and Sebago, 108. Those yielding less than 100 bushels were: Chisago, 96; Cherokee, 85; Ontario, 82; Triumph, 66; B 164-25, 66; Essex, 55; Progress, 53; and Maine Pungo, 52.

Garrett County, DeBerry Farm, Oakland, Md.

In the Garrett County test plots, all of the seed was planted in 4-piece tuber units in four 80-plant randomized replications. The plots were sprayed with Bordeaux mixture 4-4-50 with 1 pound of 50% wettable DDT added in every other application; also, one very early application using 1 pound of 50% wettable DDT in 50 gallons of water. In the varieties harvested prior to September 15, 8 applications were made, and in those harvested after September 15, 10 applications were applied.

Varieties Harvested Prior to September 15

On May 10, 15 varieties and 2 seedlings were planted and on September 10 were harvested. The stands were very good with all varieties, none having less than 93%. The 2 varieties giving the largest yields were LaSoda, with 254 bushels per acre of U.S. No. 1 potatoes, and Canus, with 326 bushels. The following varieties yielded neither significantly[7] more nor significantly less than Irish Cobbler which yielded 269 bushels: Waseca, 321 bushels; Marygold, 305 bushels; Yampa, 283 bushels; Chisago, 283 bushels; Cherokee, 282 bushels; Maine Pungo, 279 bushels; Satapa, 274 bushels; Pawnee, 264 bushels; Triumph, 260 bushels; Progress, 245 bushels; Katahdin, 242 bushels; 1276-185, 235 bushels; and Maine 515-2, 221 bushels. Only White Cloud, with 192 bushels, yielded significantly less.

6/ LSD at 5% level = 63.52 bushels.

7/ LSD at 5% level = 53.7 bushels.

Varieties Harvested After September 15

In an adjoining plot, 11 varieties and 4 seedlings were planted. The yields fell into 2 groups, but neither of the groups yielded significantly[8/] more nor significantly less than Smooth Rural (Mason) which yielded 337 bushels of U.S. No. 1 potatoes per acre. Those yielding more than Smooth Rural were Potomac, with 410 bushels; Sebago, with 367; White Pontiac, with 364; Red Pontiac, with350; B 355-44, with 349; Russet Sebago, with 342; and Kennebec with 339. Those yielding less were 46125, with 332; Ontario, with 329; Pontiac, with 301; Maine B 73-10, with 266; CS 3175, with 262; and Essex, with 254.

Eleven varieties have been included in the Garrett County tests for the past 3 years.

The largest average yield was obtained from Potomac with 508 bushels of U.S. No. 1 potatoes per acre. Five other varieties, which averaged over 400 bushels were Essex, 461; Sebago, 440; Kennebec, 434; Ontario, 431; and Pontiac, 405. The earliest-maturing varieties in this group are Essex and Pontiac, and both mature sufficiently early to allow the planting of cover crops after they are harvested. Potomac is the latest-maturing variety in the group. Ontario is the best variety for planting in scab-infested soils because of its resistance to scab; and Kennebec has had the most resistance to late blight in the group.

8/ LSD at 5% level = 74.75 Bu.

MASSACHUSETTS

Karl Koch

Eastern States Farmers' Exchange Potato Test Plots 1951

Four identical plots were conducted in four widely separated locations. Each plot was planted in a commercial potato field and was cultivated and sprayed in the same manner as that of the cooperator's potatoes. Each plot was of the randomized type, 12 rows wide and 120 feet long, and was divided into 4 replications of 30 feet each.

The Dave Cesan farm is located in Feeding Hills, Mass., and the soil is of a sandy loam type. The plot was planted on the 15th of May, following a year in cabbage, preceded by 6 years of alfalfa. It was fertilized with 1,500 pounds of 8-16-16 per acre in the row and dug on September 26. There was a normal amount of rainfall throughout the growing season.

The Fred Oswald farm adjoins the town of New Tripoli, Pa. This plot was located on high ground of a shaly type. There was ample rainfall throughout the growing season with an average precipitation of 4.5 inches each month, which was ideal for plant growth. Since Mr. Oswald carries on a 3-year rotation plan, the field was in sod the previous year. The fertilizer used consisted of 600 pounds per acre of 8-16-16 in the row and a side dressing later of 600 pounds of 8-16-16. The plot was planted May 9 and dug October 6.

The Eli Nolt farm is in the vicinity of New Holland, Pa., and the soil in the field containing the plot was clay loam type. The growing season was rather dry, resulting in the potato plants dying early in the season. This plot was planted May 8 and was in sod the previous year. A thousand pounds per acre of 8-16-16 was plowed down with the sod in the spring, and in addition a thousand pounds of 5-10-10 was used in the row at planting time. This plot was dug on October 2.

The Fred Bloom farm is located near Ebensburg, Pa., and consists of a shaly type of soil. The plot was planted May 10 and was in oats and clover the year before, the clover being plowed down just before planting. For fertilization, the plot had 500 pounds of 4-12-16 and 3 tons of manure per acre plowed down with the sod crop. At planting time, 500 pounds of 8-12-16 per acre was placed in bands in the row. There was not sufficient moisture for good plant growth during the season, resulting in the vines dying rather early. The plot was dug October 4.

Potato Varieties and Seedlings Included in
Eastern States' Test Plots 1951

United States Department of Agriculture, Source:

Cherokee - Medium, resistant to late blight and scab.
Kennebec - Late, resistant to late blight.
Pungo - Early, resistant to late blight.
Teton - Late, resistant to ring rot.
B73-10 - Early, resistant to late blight.
B355-44 - Late, resistant to ring rot and late blight.

Eastern States, Source:

Cobbler
Katahdin
Green Mountain

Minnesota Seed Potato Certification Department, Source:

Irish Cobbler - Early, high-yielding strain.

Maine State Seed Board, Source:

Katahdin - Late, latent virus-free strain.

Pennsylvania Agricultural Experiment Station, Source:

2 x J-1 Late, resistant to late blight.

The yields for the four locations are given in Eastern States' table 1.

Eastern States' table 1. Potato variety tests in four locations in Eastern States' Territory, 1951.

Variety	Yield per Acre - U.S. No. 1								Yield Ave. per Acre		Yield ave. per plot
	Cesan Farm		Oswald Farm		Nolt Farm		Bloom Farm				
	Bu.	Pct.	Bu.	Pct.	Bu.	Pct.	Bu.	Pct.	Bu.	Pct.	Lb.
Gr. Mountain	522	93	708	94	428	91	486	93	536	93	61.8
Teton	420	94	789	96	456	95	428	91	523	94	59.8
Kennebec	518	95	774	93	285	94	477	95	513	94	59.7
Me. Katahdin	402	94	783	95	377	92	428	96	497	94	57.0
B355-44	476	94	673	95	337	88	385	95	468	94	54.2
E.S. Katahdin	417	93	709	95	315	93	422	96	466	95	53.8
2 x J-1	562	86	584	89	226	60	483	90	464	84	54.5
Pungo	390	93	592	95	339	93	442	95	441	94	50.7
Minn. Cobbler	501	92	578	92	304	91	379	90	440	91	51.3
B73-10	280	89	675	96	228	83	469	96	413	93	47.4
E.S. Cobbler	410	90	604	95	283	93	352	88	412	92	47.8
Cherokee	418	87	475	88	325	91	371	92	397	89	46.0
Ave. per Farm	443		662		300		427				

Eastern States' Table 1 continu

Eastern States' table 1 continued.

Variety	Yield per Acre- U.S. No. 1								Ave. Yield per Acre		Yield ave. per plot
	Cesan Farm		Oswald Farm		Nolt Farm		Bloom Farm				
	Bu.	Pct.	Bu.	Pct.	Bu.	Pct.	Bu.	Pct.	Bu.	Pct.	Lb.
L.S.D. 5%											
Lbs. Per Plot	12.5		13.2		9.2		12.3				7.2
Bu. per Acre	93.9		116.6		92.1		108.6		49.2		
F - Factor	5.5		5.8		4.8		1.5				4.1

Observations on the Potato Varieties in the 1951
Eastern States' Test Plots

The following observations on vine maturity were made at the Dave Cesan Farm, while the observations on tuber appearance are a composite of all four plots:

Green Mountain	Late maturing. Tubers fair type.
Teton	Early maturing. Tubers good type.
Kennebec	Late maturing. Tubers fair type
Katahdin (Maine)	Medium maturing. Tubers good type.
B355-44	Late maturing. Tubers good type
Katahdin (Eastern States)	Medium maturing. Tubers good type
2 x J-1	Very late maturing. Tubers poor type, very small.
Pungo	Early maturing. Tubers fair type.
Cobbler (Minnesota)	Early maturing. Tubers fair type.
B73-10	Early maturing. Tubers good type, some russeting.
Cobbler (Eastern States)	Early maturing. Tubers fair type.
Cherokee	Medium maturing. Tubers poor type

November 2, 1951

MASSACHUSETTS

Karol J. Kucinski and Ralph Donaldson

Fifteen varieties of potatoes were tested in 1951 for yield at the Massachusetts Agricultural Experiment Station, Amherst, Mass. Each variety was planted in 200-ft. single-row plots. Green Mountain, Cobbler, and Katahdin were replicated four times. One ton per acre rate of 5-10-10 was used of which one-half was broadcast and the other half applied in drill. Tractor and sprayer rows were discarded. Plots were sprayed at weekly intervals using 10-5-100 bordeaux mixture.

The table of yields follows:

Rank	Variety	Yield per Acre			Specific Gravity	Starch
		Size A	Size B	Total		
		Bu.	Bu.	Bu.		Pct.
1	Green Mt.	463	18	481	1.083	14.58
2	Chippewa	416	17	433	1.065	10.72
3	Essex	400	36	436	1.058	9.32
4	Sequoia	398	15	413	1.062	10.12
5	Ontario	387	26	413	1.061	9.90
6	Marygold	368	12	380	1.075	12.80
7	B637-14	360	8	368	1.061	9.90
8	Irish Cobbler	357	16	373	1.069	11.57
9	Kennebec	349	15	364	1.067	11.15
10	Sebago	344	14	358	1.060	9.74
11	Teton	331	11	342	1.064	10.51
12	Pungo	322	8	330	1.071	12.00
13	Mohawk	303	8	311	1.070	11.80
14	Katahdin	301	17	318	1.062	10.12
15	B355-14	290	15	305	1.064	10.51

MICHIGAN

E. J. Wheeler and H. C. Moore

Project Title: Potato Breeding

Project Leaders: E. J. Wheeler and H. C. Moore

Assistant Cooperators: Arthur Wolcott, Ashley Berridge, Branch Stations; Clyde Burton, Dattajeerao K. Salunkhe, and Norman Thompson, graduate students.

Plan of Work: The general over-all plan was routine work of making crosses, growing the seedlings in the greenhouse, and planting to the field. Selections from crosses made in Michigan, also tubers from seed furnished by U.S.D.A. in previous years, were tested to determine their behavior under many conditions. They were grown in the scab-resistance studies plot, late blight test, and tests on such qualities as texture and discoloration were made.

The more promising seedlings from selections made in previous years were grown in several sections of the State under soil conditions ranking from heavy sandy loam to sandy loam to muck soils. The muck investigations are gaining in importance, since the potato acreage has been on the increase on this soil. The acreage of potatoes has been decreasing year by year on the sandy soils.

Certain culture practices are important in determining the value of any new variety. This figured in the plan when projects such as irrigation and date of planting were initiated and carried to completion.

More potato chips are manufactured and consumed in this area than in any section of the country, therefore, it is fitting to test varieties and cultural practices to insure the chipper standard raw material with which he can manufacture a superior product.

Location: Central Experiment Station, East Lansing, Mich., Branch Stations at Lake City and Chatham, Mich., and on the farms of Reisner Bros. & Hopp, Rogers City, Mich., and Orval Hamiltion, Saulte Sainte Marie, Mich.

Results: Potato chip studies.

Several varieties planted at three dates were grown at Lake City to furnish material for potato chip studies. Specific gravity has been determined on these varieties. Chipping tests are being made on the varieties and dates, throughout the winter. The varieties included in the test are Russet Rural, Irish Cobbler, Kennebec, Sebago, Pontiac, Chippewa, and Katahdin. All of the varieties with the exception of the Chippewa were grown in a similar test at East Lansing.

The varieties tested, date of planting, and specific gravity are given in Michigan table 1.

Michigan table 1. Varieties, date of planting, and specific gravity in tests in Michigan at Lake City, 1951.

Variety	Date planted	Specific Gravity
Russet Rural	May 4	1.078
	May 23	1.074
	June 16	1.068
Irish Cobbler	May 4	1.082
	May 23	1.076
	June 16	1.075
Kennebec	May 4	1.078
	May 23	1.076
	June 16	1.076
Katahdin	May 4	1.076
	May 23	1.076
	June 16	1.068
Chippewa	May 4	1.074
	May 23	1.072
	June 16	1.064
Sebago	May 4	1.077
	May 23	1.074
	June 16	1.070
Pontiac	May 23	1.069
	June 16	1.067

Potato-Breeding Material

The material for parent stock in making crosses constitute approximately 80 superior seedlings. The stock first must have high specific gravity and white color after boiling. Next in importance is yield, and when the parents show resistance to disease they are used most in determining the parents for the crosses. Two crops of seedlings were grown from true seed to maturity in the greenhouse, one in early spring and the other in late summer and early fall. The older parent material have shown high specific gravity and good color when compared with tests made in previous years.

Regional Tests

Advanced-generation seedlings of not more than three from each State in the North-Central Region were grown in a comparative yield test at Lake City in 1951. A summary of the test is in the process of analysis at the Iowa Statistical Laboratory.

Advanced Seedlings for Introduction

Outstanding seedlings are increased for further testing. We are fortunate in having two seedlings at the point where they are being increased for commercial production. Seedling No. B 505-3 is from the cross Chippewa x 47102. It is from a seedling progeny sent by the U.S.D.A. in 1944. It has high dry matter, good tuber shape, and will resist moderate scab-infested soils. It is medium to late in maturity. During the season of 1952, 600 bushels are to be grown for increase. Another seedling, B 69-17, has been increased until the available supply is approximately 300 bushels. Both of these seedlings will be tested on several farms in the potato-growing areas of Michigan in 1952.

Muck Tests

Michigan does not have a satisfactory variety for muck soils. The Katahdin and Sebago at present comprise the varieties grown on this soil. The Cherokee has been tested but in most instances is inferior to the other two varieties named. In 1951 a few more than 300 seedlings were grown in 5-hill lots on a good muck soil at the Muck Experiment Station. Tests have been made for dry matter and color on a few. The other, will be tested in the near future.

Seed increase plots at Lake City in 1951 will furnish seed for further testing on the muck soils in 1952.

Kennebec

Sufficient seed of the Kennebec variety has been distributed to observe the commercial value. In general, highest yields and the best type tubers are obtained in sections of Michigan that have the most ideal growing conditions. Under adverse or less desirable conditions, Sebago and Katahdin will produce much better shape tubers. Three years' tests on muck soil were inferior to the other varieties and seedlings tested. The late blight resistance and the high specific gravity of the Kennebec are its strong virtues. Verticillium wilt appeared in many plots in 1951.

MICHIGAN

J. H. Muncie and G. W. Trytten

Approximately 6,500 first-year seedlings from 31 crosses were grown in the plots heavily infested with the scab organism. These were grown under irrigation at the Lake City Experiment Station.

Fifty-two seedling selections have been saved for further testing in 1952. In addition, advanced lines consisting of 38 selections from 28 crosses from Dr. F. J. Stevenson, 18 selections from Dr. R. W. Hougas (Brazil Selections), and 185 selections from 36 crosses made by the writer also were tested in 5-hill lots in the field for scab resistance. Results of these tests are given in Mich. table 1.

Michigan table 1. Reaction of potato seedlings to scab infection.

Source	Selections	Seedlings infected				
		Type of scab lesion				
		0	1	2	3	4
	No.	No.	No.	No.	No.	No.
U. S. D. A.	38	5	19	5	7	5
Brazil (Hougas)	18	0	4	4	2	8
M. S. C. - B. P.	185	7	65	35	35	43

Certain of these seedlings with lesion types 0, 1, and 2 have been saved for parent material in greenhouse crosses for 1952. Six seedlings have been placed with farmers for scab resistance tests. Field tests of seedling selections for resistance to infection by Fusarium solani var eumartii were increased to include 33 from Dr. F. J. Stevenson, 341 from Professor E. J. Wheeler, 15 from Dr. Hougas (Brazil selections) and 75 developed by the writer.

These were grown in 5-hill lots, many of them duplicated, in soil that had been inoculated each of 3 successive years with the causal pathogene. All seedlings were planted in May and grown under irrigation.

From each lot at harvest (October) 15 tubers were clipped at the stem end and examined for evidence of infection. A duplicate sample was placed in storage at 50° F. for later examination to check on first readings.

Results of these tests are given in Mich. table 2.

Seedlings showing 30 percent infection or less would probably have some merit for growing in naturally infested soils. Certain seedlings showing low infection will be used as parental material in greenhouse crosses.

Mich. table 2. Reaction of potato seedling to Fusarium solani var eumartii infection.

Infection classes	Seedlings in each class				Commercial varieties
	U.S.D.A.	Brazil	Wheeler	M.S.C.-B.P.	
Pct.	No.	No.	No.	No.	
0 - 10	1	0	0	4	--------
11 - 20	4	0	21	8	R. Burbank, Chippewa, Sequoia
21 - 30	5	0	30	9	Kennebec, Sebago
31 - 40	2	2	54	9	Teton, Russet Rural
41 - 50	4	1	20	7	Menominee, Ashworth
51 - 60	9	4	74	15	Waseca, Pontiac
61 - 70	0	4	31	3	Empire, White Rural
71 - 80	2	3	55	10	Irish Cobbler
81 - 90	2	0	22	3	R. Burbank seedling
91 - 100	2	1	34	7	Seneca, Katahdin
Total	33	15	341	75	

MINNESOTA

Leaders: F. A. Krantz, Carl J. Eide
Assistants: Fred A. Cowan, Florian I. Lauer

Locations: University Farm, Potato Research Station, Castle Danger, Minn.; Branch stations at Duluth, Crookston, and Grand Rapids, Minn.: Red River Valley Growers Association, East Grand Forks, Minn.; and Farm Cooperators, Hollandale, Minn.

Potato Breeding

Introduction

The North-Central Potato-Breeding Committee met at Castle Danger, Minn., August 20 to 22, 1951. A detailed report of this sixth meeting was prepared and distributed by the secretary, Dr. G. H. Rieman. Dr. Rieman has suggested the desirability of a written summary by the host institution describing the material examined at the field conference. The field conference was devoted exclusively to experimental plantings. A brief summary of these plantings and their objectives is presented here.

Nursery Plot

This is a maintenance plot of breeding material. Forty-five varieties and 47 hybrid and inbred selections are grown in 5-hill rows in 2 blocks. It is a reservoir of breeding stocks, used in the past and occasionally drawn upon at the present time for particular characters.

Selfed Lines

Two hundred inbred selections, the initial parents, and some varieties used as standards were divided into six distinct tests of two to four randomized blocks. The objectives of the tests ranged from a screening test to tests in which successive inbred generations were studied in relation to each other and to their parental clones. Seedling families from varietal crosses, top crosses, and F_1 between inbreds were available for observation.

Accession and Observation Plot

Thirty-six clones, mostly advanced selections from breeders in North-Central States, were grown in our accession plot consisting of a three-hill row of each clone in each two blocks. From this accession plot clones are either discarded, moved to the nursery, or included in one of the regular tests.

Adaptation and Screening Test

This test made at Castle Danger, Crookston, and East Grand Forks, Minn., consisted of a heterogeneous group of 63 selections having potential commercial and breeding value. From this test, selections are either discarded, placed in the nursery for breeding use, included in the final commercial adaptation test, or continued for another season in this screening test.

Seedlings with Scab-Resistant Parents

Duplicate samples are taken from all greenhouse-grown seedling families having scab-resistant parentage. In the spring one sample (22 inbred and hybrid families, 3,048 seedlings) was grown in the scab nursery at Grand Rapids and a similar sample at Castle Danger. One hundred seven selections were made at Castle Danger and 94 at Grand Rapids. These selections go into a preliminary screening test of scab selections, consisting of 2 blocks at Castle Danger and 1 block in the scab nursery at Grand Rapids. The past year this test contained 118 selections, of which 45 were saved for further preliminary testing and 23 were placed in our adaptation test for scab-resistant selections. This adaptation test consists of locations at Crookston, East Grand Forks, Hollandale, and Castle Danger. Selections are grown in 5-hill rows in from 2 to 4 blocks at each location, and continued in the scab nursery at Grand Rapids. Seventy-nine selections were in this test the past year. Three have been sent to growers for increase, and 19 will be continued in the test this coming season.

Seedlings from Late-Blight-Resistant Parentage

Susceptible seedlings from parents resistant to late blight may be eliminated from plots before being transplanted to 3-inch pots in the greenhouse or they may be eliminated in the late-blight nursery at Castle Danger. Both methods have been effective for the past 3 years. Seven hybrid and inbred seedling families with a total of about 400 seedlings were grown the past year. Twenty-four individuals, some from each of the seven families, were selected for further tests. Eighty-two selections resistant to late blight were in preliminary adaptation tests at Castle Danger, Crookston, and East Grand Forks. Of these 82 selections, 3 have been sent out for increase, 14 will continue in the test, and 16, mostly inbreds, will be retained for breeding.

Seedlings from Scab and Late-Blight-Resistant Parentage

Nine inbred and hybrid seedling families (1,616 seedlings) from parents resistant to both scab and late blight were grown in the scab nursery at Grand Rapids and the late blight nursery at Castle Danger. A heavy infection of late blight at Grand Rapids made possible selection for resistance to both scab and late blight at this location. Forty-five selections were made at Grand Rapids and 58 at Castle Danger. Of the 42 selections in the adaptation test at Castle Danger, Crookston, East Grand Forks, and Hollandale, 6 are being increased, and 5 others retained for breeding use.

Resistance to Virus X

The objective is to secure adapted selections resistant to virus X, for use as parents in combining resistance to virus X, with resistance to scab, late blight, and adaptation to Minnesota conditions.

Fifty-four selections, resistant to virus X, were grown at Castle Danger in a screening test for general desirability. One of these selections was tested, and appeared to be well adapted to the Red River Valley. Four seedling families from virus-resistant parents were grown in 1951. Initial resistance was obtained from Seedling 41956.

Species Hybrids

Three strains of Solanum demissum are being used to secure hybrid selections resistant to more strains of the late-blight organism than the present selections. In this study scab-resistant S. tuberosum parents are being used. Hybrids of S. phureja are also being studied. Reciprocal crosses between S. demissum and S.phureja produced some seed. The germination has not been tested. Hybrids of S. tuberosum with either species cross readily with the other species. Along with disease resistance, the transfer of the hybrid vigor into S tuberosum type is being studied.

MINNESOTA

Leaders: Carl J. Eide, F. A. Krantz
Assistants: C. E. Logsdon, H. D. Thurston

Locations: University Farm, St. Paul, Minn.; North Central Station, Grand Rapids, Minn.; Potato Research Station, Castle Danger, Minn.; Farm Cooperators, Hollandale, Minn.

The development of disease-resistant varieties of potatoes

Common Scab Resistance

The scab test plots are described in the preceding report on potato breeding. A preliminary test was made at Grand Rapids of 118 selections, and an adaptation test of 79 selections, which were grown on heavily infested sandy loam at Grand Rapids and on infested peat at Hollandale. There is little or no scab at Crookston, Grand Forks, or Castle Danger. The 42 selections of late-blight and scab-resistant parentage were tested for scab resistance at Grand Rapids and Hollandale. Results are shown in Minn. table 1.

Minn. table 1. Reactions of 3 groups of selections of potatoes to common scab on sandy loam and peat soils. 1951.

Location and soil type	Numbers of selections of each parentage		
	Resistant to scab (Preliminary test) 118	Resistant to scab (Adaptation test) 79	Resistant to scab and late blight 42
	Numbers with 1 or 2 type scab reaction 1/		
Grand Rapids (Sandy loam)	59	36	7
Hollandale (Peat)	--	54	5
Both locations	--	29	1

1/ 1 type pustules are very superficial; 5 type, pit scab. 1 and 2 types are suitable for commercial purposes.

Late Blight Resistance

The material in these tests has been described in the preceding account of the breeding work at Minnesota. Only a few comments on the progress of the tests in 1951 are necessary here.

Selections of late-blight-resistant parentage grown at Castle Danger were inoculated by distributing heavily infected potted Cobbler plants throughout the plot. The plants were also sprayed twice with a sporangial suspension. Chisago and Waseca check rows, planted about every 10 rows, were heavily infected, but all of the material under test was immune or highly resistant. Since this material had been in previous field tests or screened as seedlings in the greenhouse, this result was to be expected except for the possible appearance of new races of blight fungus. Apparently all of the selections are resistant to the race or races of Phytophthora infestans present at that time. Kennebec and Cherokee appeared immune, although they were found infected in several farmers' fields in other parts of the State.

In the greenhouse 40 varieties and selections were inoculated with races B, C, D, BC, BD secured from Dr. L. C. Peterson. A number of the Minnesota selections were susceptible to some of these races, especially to race BD, but too many others appeared immune to permit regarding the results as reliable. Further, more extensive tests will have to be made.

A careful search was made at Castle Danger for evidence of adaptation, but none was found. Experiments were also continued in the greenhouse without finding any indications of adaptation

Tuber Resistance to Late Blight

Tubers of 99 varieties and selections grown at Crookston were inoculated by dipping the tubers from one hill (10-20) in a suspension of sporangia and zoospores of Minnesota isolates of Phytophthora infestans. Half of each lot was injured by scratching lightly with pins. As in previous years, non-injured tubers usually escaped infection, only 5 being infected. Of the injured lots, 66 varieties or selections were infected. Many of the 99 in the 1951 test had been tested also in 1949 or 1950 or both. Five selections have not been infected in any of the 3 years.

MINNESOTA

Orrin C. Turnquist

In 1951, 16 varieties of potatoes were tested at 6 locations in Minnesota. Four of these plots were located on heavy soils of the Red River Valley and one was on the peat soil at Hollandale. The Brooklyn Center plot, in the early sand land area, was irrigated and 3 additional varieties were included at this location. A minimum of 100 pounds of seed of each variety was planted in double rows making a plot that averaged 400 feet in length. The plots were located in commercial fields and the same culture was given both.

Turnquist table 1 shows the total yield of potato varieties tested at six locations in Minnesota in 1951. Kennebec gave the highest average yield of 354 bushels per acre. Only at Donaldson in the northern part of the Red River Valley, however, did it maintain its high rank. Progress showed a very high yield but most of the tubers were barely large enough to pass U. S. minimum size requirements. Despite the fact that there was ample moisture during the entire growing season the very heavy set of tubers failed to make satisfactory size. Cherokee outyielded all other varieties at Fisher with 355 bushels per acre. It was tied for second place in yield at Donaldson with 361 bushels per acre. Both vines and tubers of Cherokee proved to be highly resistant to blight; however, a very small amount of late blight, as well as scab, was occasionally observed on the tubers. The Red Triumph is a brighter red mutant of Bliss Triumph. The difference in skin color was quite evident in all plots. There appeared to be very little difference in yield between the three strains of Triumphs but the Red Triumph was most outstanding because of its attractive color. Although C. S. 6316 was low in yield at most locations its early maturity and attractive, smooth, long tubers created much interest. Some scab lesions were observed on this selection.

A collection of varieties and selections were grown in an observation plot on peat. Turnquist table 2 gives some of the observation notes on this plot.

Turnquist table 1. Total yield of potato varieties tested at six locations in Minnesota in 1951.

Variety	Yield per acre in Red River Valley				Yield per acre and type soil		Mean
	Baker	Fisher	Stephen	Donaldson	Sandland Brooklyn Center	Peatland Hollandale	
	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.
Kennebec	277	266	316	390	405	468	354
Progress	---	---	---	---	352	---	352
Cherokee	256	355	355	361	314	---	328
Bliss Triumph	250	---	381	348	309	324	322
Red Triumph	286	284	473	307	280	287	320
Late Triumph	250	248	368	361	388	301	319
Pontiac	277	231	342	250	392	---	298
Red Pontiac	256	142	342	334	406	---	296
Chippewa	223	160	355	340	328	373	296
I. Cobbler	250	273	302	256	---	364	289
Chisago	---	---	---	---	286	---	286
White Cloud	313	106	328	265	313	380	284
Satapa	250	230	282	334	326	264	281
Russet Burbank	---	---	---	---	267	---	267
Early Ohio	277	160	263	277	300	255	255
Waseca	307	160	224	167	361	305	254
C. S. 6316	250	230	224	277	266	---	249
Red Warba	277	106	171	83	351	336	221
Katahdin	194	142	158	140	241	184	176

Turnquist table 2. Observations on varieties and selections of potatoes grown on peat in 1951.

Variety	Amount of scab	Late blight	Shape
Cherokee	None	None evident	Good
Pungo	Medium	None evident	Fair to poor
Kennebec	Slight	None evident	Good
CS 6316	Trace	Light	Very good
B 73-10	Slight	None evident	Fair (flat)
B 991-3	Severe	No late blight but severe early blight	Good
B 447-98	Severe	Light	Good
B 922-3	Severe	None evident	Good (smooth)
B 781-3	Trace	Light	Good
B 355-4	Medium	None evident	Good
B 606-67	Severe	None evident	Poor
B 446-8	Severe	None evident	Poor

MONTANA

H. N. Metcalf

Preliminary Potato Variety Trial, 1951

A group of five numbered selections, and one newly named variety were assembled for the trial in 1951. The tubers were examined for symptoms of ring rot under the ultraviolet lamp, and all except 45.11-101 were found clean. Tubers of 45.11-101, showing symptoms of infection, were discarded. All tubers were then indexed in the greenhouse for symptoms of virus infection, and any suspected of being infected were discarded.

Field planting was done by hand on May 28-29, using the tuber-unit system. Row spacing was 42 inches. Although the ground available for planting was perhaps not of the best, quite satisfactory growth was obtained.

Notes taken on July 23 indicated that B 515-2 and 456.8-1 had yet to bloom, Cherokee and 45.14-6 had white flowers, 45.11-8 showed but one dark lilac-colored flower, and 45.11-101 had a few lilac-blue flowers. A hailstorm on August 23 cut up the foliage considerably and probably delayed maturity.

The planting was dug on September 24, the identity of the tuber units being maintained, and the crop was placed in storage until January 3, 1952, when the grade data below were obtained.

At the time of grading, the following descriptive notes were taken on the tubers:

45.11-8 - Skin, red; shape, round; eyes, medium; flesh, creamy white.

45.11-101 - Skin, red; shape, round-oblong; eyes, medium-deep and darker color than skin; flesh, pale-yellowish.

45.14-6 - Skin, yellowish white, somewhat flaky; shape, round; eyes, medium-shallow, with prominent eyebrows; flesh, creamy.

456.8-1 - Skin, white, somewhat flaky; shape, round; eyes, shallow, flesh, creamy-white.

Cherokee - Skin, white with pinkish tinge; shape, flat-round, eyes, shallow; flesh, creamy-white. Tubers subject to growth cracks.

B 515-2 - Skin, netted with yellow ground color; shape, round-oblong; eyes, shallow; flesh, light yellowish-white. Tubers were better matured than Netted Gem harvested at approximately the same date; otherwise tubers had strong resemblance to those of Netted Gem.

Of these varieties, B 515-2 would seem to be the most promising one for Montana conditions, primarily because of its resemblance to Netted Gem, and also because of apparently better tuber maturity. While no specific gravity data have been obtained on this group of varieties, the tubers of B 515-2 are obviously "heavy"; this having been observed on both pot- and field-grown samples.

Cherokee seemed quite free from scab, and it will be interesting to see how it will perform at the Northwestern Montana Branch Station at Creston in 1952, where the scab problem is quite severe.

All the varieties will again be greenhouse-indexed, and if free from ring rot, will be sent to Creston for trial in 1952.

MONTANA

H. N. Metcalf and C. W. Roath

Northwestern Montana Branch Station, Creston, Montana

Nineteen varieties of potatoes were planted in trial in 1951, at the Northwestern Montana Branch Station, Creston, Montana, under the supervision of C. W. Roath, Superintendent. The planting was done on May 31, using three replications of 0.002 acre plots. Each plot was a single row 25 feet long and 3½ feet apart. Irrigation was supplied by means of a portable sprinkling system. The planting was dug on September 24, and that data obtained are presented in the Montana table 1.

Yampa was the only variety that gave a yield significantly above the general average for the trial, while Mohawk was the only variety yielding significantly below the general average.

Cayuga and Netted Gem were the only varieties on trial that showed no evidence of scab infection. Progress, Early Rose, and Yampa were only lightly infected with scab. The other varieties were rated as either "medium or "heavy" in degree of scab infection.

Ashworth, Placid, and Mohawk were rated as "fair" in degree of maturity. All other varieties were rated "good" in maturity.

Cayuga, Erie, Chenango, Kasota, Canus, Houma, Triumph and White Cloud produced tubers rated as "small". Cobbler, Progress, Waseca, Netted Gem and Yampa produced tubers rated as "medium". Katahdin, Ashworth, Placid, Early Rose and Mohawk produced tubers that were rated "large".

Cayuga, Cobbler, Erie, Ashworth, Progress, Triumph and Yampa were reported as showing a material amount of growth cracking, while Cayuga, Ashworth and Mohawk were reported as showing considerable hollow heart. In addition, Netted Gem, Early Rose, and Mohawk were reported as producing rough tubers.

For 1952, it would seem advisable to abandon those varieties that have proved susceptible to scab, and to add to the trial such newer varieties as Cherokee and B 515-2, which are reported as being scab resistant.

Montana table 1. Yield in pounds per plot and 100-lb. sacks per acre with certain other data for potato variety trials, Northwestern Montana Branch Station, Creston, Montana, 1951.

Variety	Mean per plot	Yield per acre	Scab infection	Maturity	Tuber size	Grade characteristics
	Lb.	100-lb sacks				
Cayuga	43	215	None	Good	Small	Check & hollow
Cobbler	58	290	Medium	Good	Medium	Checks
Erie	56	280	Medium	Good	Small	Checks
Katahdin	57	285	Medium	Good	Large	
Ashworth	52	260	Medium	Fair	Large	Checks & hollow
Chenango	45	225	Heavy	Good	Small	
Progress	47	235	Light	Good	Medium	Checks
Waseca	46	230	Heavy	Good	Medium	
Kasota	64	320	Medium	Good	Small	
Placid	64	320	Heavy	Fair	Large	
Canus	59	295	Heavy	Good	Small	
Early Rose	60	300	Light	Good	Large	Rough
Houma	65	325	Heavy	Good	Small	
Netted Gem	59	295	None	Good	Medium	Rough
Triumph	62	310	Heavy	Good	Small	Checks
White Cloud	55	275	Heavy	Good	Small	
La Soda	60	300	Heavy	Good	Large	
Yampa	75	375	Light	Good	Medium	Checks
Mohawk	41	205	Medium	Fair	Large	Hollow
L.S.D. at 5% point	14	72				

NEBRASKA

Report prepared by H. O. Werner
Participating in work, Robert O'Keefe and Joan M. Wallace

Potato Breeding-Horticulture Department

The season of 1951 was one of the coldest and wettest ever experienced since western Nebraska has been settled, so the major problems of the breeding program have not all been the same as in former years.

Potato Scab

The dominant impression of our 1951 Nebraska program is one of sustained suspense. Several thousand clonal lines were grown in replicated plats to find and eliminate scab-susceptible lines. Much to the breeders' dismay, scab infection was so unusually mild both as to type of scab and incidence that a satisfactory test was impossible. Tubers of the lines usually very susceptible were frequently entirely free of scab. Consequently the freedom from scab was of very little or no value for eliminating segregates. So, instead of reducing our extensive population we have added to it. We are contemplating the advisability of practicing population control at the source; i.e., reducing our crossing or true seed production program, until we dispose of much of our excess baggage.

This fiasco on scab testing occurred not only with the continuous cropped area on the Scottsbluff Experiment Substation but also with several outlying plats where commercial scab-free potatoes have not been produced within recent years. This poses a serious problem of scab-testing technique. At the Scottsbluff Station replicated plantings have been made during the past 3 years on land chosen because during the 2 previous years (4 to 5 years ago), the potatoes grown on it were all scabby to the extent that the best of them could not be sold except as "sort outs" (culls) below U.S. #2 grade, and many were too scabby for even such a marginal market. On this field throughout the last 3 years the severity of scab on the Triumph checks has diminished each year - both as to type of scab and incidence.

This leads to the hypotheses that either the scab organisms in this piece of land are becoming attenuated or that other micro flora are gaining ascendancy. A similar change in the diminution of the seriousness of the scab lesions occurred after about 10 years in the continuous potato plots and short (2- or 3-year) rotations at both the Scottsbluff irrigated and Box Butte dry-land stations. Thereafter, scab lesions were very numerous with short rotations but they finally became entirely superficial, whereas in the longer more productive rotations (6 or 7 years) scab lesions were large and deep pits but total scab incidence was much less.

This reduction of scab infection occurred in spite of the further attempt to encourage scab by annual applications of barnyard manure. The pH of this soil is in the range of 6.7 to 7.1

Attempts to induce scab in the gravel cultures used for growing the first seedling generation in the greenhouse have met with complete failure during the past 3 years. Pure cultures and mixed cultures, made by grating off the scabby areas of tubers, have been equally unsuccessful even though applied more than once with temperatures held at the optimum considered necessary for infection. The pH of these gravel beds is usually 6.2. Another scab fiasco resulted when the water came up and drowned out Dr. Peterson's block of about 300 of our clones, which he had planted on muck soil in northern Iowa. We shall endeavor to incorporate a greater amount of certainty into the scab-testing program by placing the replicates in fields with different cropping histories and by planting them earlier and not on the same date.

Late Blight

Apparently no region is safe in complacently believing that certain potato diseases will not become a menace because of favorable climatic conditions, isolation, etc.

The most extraordinary happening with the western Nebraska potato industry in 1951 was serious area-wide epidemic of late blight. The vines of many fields were completely destroyed several weeks ahead of the usual harvest date. Tuber infection varied greatly being relatively minor in some fields but destroying practically all of the tubers in quite a large number of fields. Many potatoes were salvaged in commercial fields by delaying harvest till mid-October and then picking only the sound potatoes.

Although the alarm was sounded quite early by the technical folks, many fields were not sprayed or dusted either at all or adequately, due to inexperience with the disease, lack of equipment, or dependence on the hoped for check of dry weather, which did not materialize in time. Where fields were sprayed or dusted quite soon after infection was discovered the control was very satisfactory. Whether we should go "all out" to incorporate late blight resistance into our stocks or how much to depend on the history or its absence in western Nebraska are problems now requiring decision. In view of the seed market possibilities, plus the plausibility of more frequent occurrence of the disease, in future years we shall probably consider late blight resistance at least one of the secondary objectives.

Healing of Cut Surfaces of Tubers

The studies in this field, reported last year, are being continued. We have learned that even though much difficulty in getting good field stands is sometimes encountered with poor healing varieties, such as Progress, that excellent preservation of seed pieces can be accomplished by holding the cut pieces for 3 to 6 or more days under the conditions that provide proper temperature, humidity, and aeration. However, with all methods of holding, the disinfection of cut seed pieces with Dithane (liquid or dust) or common chlorine disinfectants has enhanced the preservation. It has been hampered by formaldehyde- and mercury-containing compounds that have been used. Dusting with a mixture of lime and sulphur has been of no noticeable consequence either way. The study is being continued to determine the feasibility of using the rate of weight loss from cut potatoes as an empirical method of screening segragates with regard to their wound-healing ability.

Status of New Varieties

The commercial acreage of Progress has increased so it now seems to comprise more than half the commercial acreage of western Nebraska. Because of the commercial significance of its partial scab resistance and pronounced resistance to harvesttime cracking as contrasted with Triumph, growers and dealers seem to be willing to "put up" with the relatively small size of the tubers. The acreage of Pontiac has probably decreased slightly. LaSoda is being grown to a very limited extent. There has been a small but steady increase in White Cloud plantings because of a seed demand for it in North Carolina and its generally recognized superiority for making potato chips.

Internal Water of Plants[1/] [2/]

The changes in relative turgidity of leaves has been used as the initial method in a basic study to develop a technique for evaluating heat and drouth resistance of varieties, etc., without the uncertainties involved in a dependence on field testing. [3/]

The relative turgidity was determined by procuring pairs of samples of leaves (each leaf sample 30 sections, 14.2 mm. diameter) of the different varieties or soil moisture treatments, at various times throughout the day, drying one sample at once to determine the moisture content of the leaf and then floating the other for 24 hours and then determining the dry matter and moisture in it. The loss of water, during one hour prior to sampling, from a pair of black spherical atmometers was used as a comprehensive measure of the force exerted by the atmosphere on the moisture in the leaves.

The following are a few of the more significant findings of this study during the past year that are pertinent to the breeding project (see Nebr. table 1 for supporting data):

1. Throughout the growing season the relative turgidity of leaves of plants well supplied with water usually ranges from a high of 95% + 100% just before day-break to an early afternoon low of about 72% to 80%.

1/ The work reported under this title is only of a preliminary nature. This early report is being made for the information of plant breeders, but we request that this report be not cited as a literature reference.

2/ The field work of this phase was by Joan M. Wallace.

3/ Weatherley, P.E.: Studies in the water relations of the cotton plant
I. The field measurement of water deficits in leaves. New Phytologist 49: (1) 81-97: March, 1950

II. Diurnal and seasonal variations in relative turgidity and environmental factors. New Phytologist 49: (1) 36-51: May, 1950.

2. Soil-moisture content does not appear to influence the change in relative turgidity of the leaves until it drops below about 60% to 70% of the available moisture content, then the relative turgidity of leaves decreases both as the soil becomes drier and during the midday period of maximum transpiration.

3. Varieties differ comparatively little in the relative turgidity of their leaves when soil moisture is abundant but as soil moisture becomes less readily available there are significant differences between varieties. These increase as soil moisture decreases or the water deficit of the air increases.

4. The relative turgidity of potato leaves was found to be influenced more by the atmospheric conditions than by soil moisture or variety.

5. Light intensity exerted little influence on leaf turgidity except as it was a part of the forces that influenced water loss from black atmometers.

Nebraska table 1. The following data are based on samples, of two varieties or soil-moisture conditions, taken at the same sampling periods at various times of day on different dates at Scottsbluff in 1951.

Treatment No.	Variety or treatment	Mean relative turgidity	Regression coefficient or loss in percentage of relative turgidity per each 1 cc water lost from black atmometer in 1 hour prior to sampling. (R.T./cc Black Atmometer)	Ratios of regression coefficients (R.T./cc Blk.Atm.)
		Pct.	Cc.	
	Two Varieties High Soil-Moisture Content (23 sampling times) 1/			
P1	Progress	89.7	-2.713 2/	
T1	Triumph	88.3	-2.807	T1/P1 1.031
	Two Varieties Medium Soil Moisture (8 sampling times)			
P11	Progress	89.5	-2.950	
T11	Triumph	84.8	-3.814	T11/P11 1.301
	Soil Moisture Comparisons High vs. Medium with Progress (8 samplings)			
P1	High Moisture	90.5	-2.619	
P11	Medium Moisture	89.5	-2.950	P11/P1 1.126
	With Triumph (8 samplings)			
T1**	High Moisture	87.2	-3.057	
T11	Medium Moisture	84.8	-3.814	T11/T1 1.248
	High Moisture vs. Dryland - Progress (14 samplings)			
P1	High Moisture	87.9	-2.583	
P6	Dryland	81.9	-3.226	P6/P1 1.249

1/At each sampling time, paired samples each of 30 sections 14.2 mm. diameter were cut per variety, etc.

2/The correlation coefficients for all of these groups of samples were greater than 0.939 except T1** which was 0.856.

In view of these preliminary findings it is believed that this method may be used for determining basic differences in the water retention ability of leaves of different varieties. It appears further that such studies should be conducted with plants being grown in soils with a relatively low moisture content when maximum differences due to variety characteristics are most certain to be expressed.

Culinary Quality

The culinary quality of the late crop has been lower than that in most years as determined both by specific gravity and cooking tests. The generally low September temperatures and the early killing of the vines by blight are believed to have been the major cause of this low quality.

A cooking test with a panel of judges was conducted in the fall of 1951 with 24 lines or varieties with dryland potatoes from the Box Butte farm. 4/. The results with the nine commercial varieties, most of which are relatively new, and nine of the advance breeding lines or pollen parents are shown in Nebraska table 2.

Nebraska table 2. Means of values in cooking test of western Nebraska dryland-grown potatoes, December 1951.

Variety or line	Mean Sp. Gr. 1/	Mean rating of 7 judges - 3 cookings			
		Texture (50 perfect)	Flavor (30 perfect)	Color (20 perfect)	General (100 perfect)
Named Varieties					
Cayuga	84.8-2	45.2-1 2/	24.9-2	16.2-4	86.3-1
White Cloud	82.8-3	42.3-3	24.2-6	14.3-12	80.8-4
Menominee	78.1-6	37.9-8	21.8-9	14.9-9	74.6-7
Triumph	75.9-10	36.0-10	22.5-5	14.9-10	73.3-8
LaSoda	75.9-11	35.6-11	21.5-12	13.3-16	70.5-12
Mohawk	76.8-7	33.8-12	22.0-8	16.1-5	71.9-10
Rus. Sebago	75.7-13	33.3-13	21.6-11	15.7-6	70.7-11
Progress	79.3-5	30.0-18	20.5-15	16.7-2	67.2-14
Pontiac	62.6-24	27.6-20	18.6-22	14.2-13	60.3-20
Advance or Breeding Lines					
59.41-P1	84.9-1	43.7-2	25.2-1	15.1-8	84.0-3
213.43-3	82.1-4	42.1-4	24.6-3	17.8-1	84.5-2
26.44-1	75.8-9	40.4-5	22.5-4	13.1-19	75.9-6
89.46-2	75.8-12	38.2-14	21.6-10	13.2-18	73.0-9
127.46-1	71.7-16	37.2-15	21.1-13	10.6-24	68.9-13
213.43-2	71.6-17	32.2-14	19.3-18	14.4-11	65.9-15
20.42-9	73.2-15	31.4-15	21.1-14	12.4-21	64.9-17
20.44-2	68.9-20	30.1-16	20.1-17	11.5-23	61.7-19
120.40-6	75.0-14	29.9-2	20.4-16	15.2-7	65.5-16

1/ 1.0 omitted and decimal moved to right three places.
2/ Second number = relative rank among 24 lots tested.

4/ The cooking test was a joint project with the Division of Food and Nutrition Research of the Department of Home Economics, represented by Dr. Ruth M. Leverton.

Of these breeding lines, 59.41-P1 has been highly resistant to scab in all of the tests in Nebraska. It produces fertile pollen, is fairly late, and has light red to pink tubers. The type of tubers is not quite good enough for commercial use except under conditions most favorable for good tuber type to develop. All the other numbered lines, except 120.40-6, are promising red-tuber lines but probably none possesses any scab resistance worth considering. The line 120.40-6 is a vigorous growing medium to late line, producing high yields of relatively good-type tubers.

Adaptation Tests of Varieties and Clones
(Field Work by Robert O'Keefe)

From 10 to 12 of the relatively new varieties and 10 to 15 advance selections from the Nebraska program were planted as early potatoes in 5 adaptation plots in eastern and central Nebraska (3 irrigated, 2 dry land), and as a late crop in 13 plots in various places in western Nebraska (8 irrigated, 5 dry land). The averages of the varieties in the trials in these various places are shown in Nebraska tables 3, 4, 5, and 6.

In eastern and central Nebraska climatic conditions (cool, moist) were exceptionally favorable for high yields of potatoes. At Omaha, in a non-irrigated trial, the specific gravity of the tubers was higher with all varieties than that in most years, having been as high this year as in most of the western Nebraska late-crop plots (Nebr. table 3). The top-ranking varieties in yields of the U.S. #1 potatoes were Red Warba, Waseca, and a red seedling, 189.45-6.

In central-Nebraska irrigated trials the high-yielding lines were 189.45-6, Irish Cobbler, Red Warba, LaSoda, 26.44-1, and White Cloud (Nebr. table 4).

In the western dryland trials Red Pontiac, Kasota, White Cloud, LaSoda and Cayuga were the five top producers of U.S. #1 potatoes followed by two advance lines 120.40-6 (white) and 26.44-1 (red and high specific gravity) Nebraska table 5).

In the irrigated western trials the top five yields of U.S. #1 were produced by Red Pontiac, Kasota, LaSoda, Triumph, and line 120.40-6 (Nebr. table 6). A number of advance selections with red tubers gave relatively high yields. Several had tubers of relatively high specific gravity.

Central States Cooperative Test

One of the Central States uniform cooperative potato-variety trials was conducted at Scottsbluff with irrigation. The results of this trial are incorporated in the general report prepared and submitted by Dr. C. E. Peterson, the North-Central States Potato-Breeding coordinator.

Nebr. table 3. Trial of 23 varieties near Omaha (non-irrigated, corn-belt conditions), when grown as an early crop. (April-August, 1951)

Variety and line number	Yield per acre		Of total				Mean specific gravity 1/
			U.S. #1 A size	Major defects			
	Total	U.S. #1		Scabby	Rough	Late blight rot	
	Bu.	Bu.	Pct.	Pct.	Pct.	Pct.	
Chisago	298	58	20	32.3	17.5	0	66.4
Essex	380	143	38	36.0	5.2	0	60.1
Irish Cobbler	90	20	22	11.8	8.2	0	78.9
LaSoda	351	133	38	37.9	13.0	0	77.3
Pawnee	140	38	27	33.1	0	0	59.8
Red Pontiac	296	82	28	43.4	4.6	0	54.5
Red Warba	389	249	64	16.0	5.9	0	68.3
Satapa	290	77	26	48.6	0	0	59.3
Waseca	349	225	64	19.3	1.4	0	65.4
White Cloud	268	126	47	15.2	4.2	0	70.9
120.40-6	187	72	38	18.1	8.7	0	65.4
20.42-9	230	59	26	21.7	19.3	0	64.1
140.42-1	321	142	44	27.2	6.9	0	71.4
204.43-1	295	92	31	44.0	[illegible]	0	82.6
213.43-2	297	150	50	16.9	2.6	0	75.1
213.43-3	281	140	50	18.0	2.6	0	76.3
311.43-1	330	155	47	20.7	4.0	0	78.2
20.44-2	188	73	39	18.8	8.0	0	55.8
26.44-1	306	98	32	30.6	3.2	0	68.7
189.45-6	353	153	43	25.0	7.1	0	69.3
89.46-2	328	208	63	8.0	12.2	0	62.7
127.46-1	269	173	64	21.0	0	0	65.1
Minn. 6	145	22	15	22.4	27.3	0	67.9

1/ 1. 0 omitted; decimal point moved to right 3 digits.

Nebr. table 4. Means of results in 3 irrigated tests with 23 varieties or clones, in Central Nebraska, when grown as a summer crop (April to August), 1951.

Variety and line number	Yield per acre		Mean of total				Mean Specific gravity
			U.S. #1 A size	Major Defects			
	Total	U.S. #1 A size		Scabby	Rough	Late blight rot	
	Bu.	Bu.	Pct.	Pct.	Pct.	Pct.	
Chisago	418	347	81	.6	2.0	8.44	59.7
Essex	581	472	82	5.6	3.1	0.41	62.7
Irish Cobbler	582	509	88	.8	1.1	0	68.4
LaSoda	562	466	83	.4	3.2	3.52	58.9
Pawnee	411	348	82	1.7	0	3.38	64.0
Red Pontiac	532	434	88	2.2	1.4	0.06	56.4
Red Warba	609	506	83	5.1	3.5	1.83	65.4
Satapa	395	314	77	1.0	2.2	3.96	59.3
Waseca	445	394	88	1.8	.3	5.07	61.0
White Cloud	520	415	84	4.8	3.1	0.14	67.6
120.40-6	420	350	83	.6	1.1	0.54	61.5
20.42-9	466	385	82	1.5	3.4	0.76	63.9
140.42-1	442	339	78	.8	7.3	0.50	58.1
204.43-1	395	320	82	1.1	6.4	3.50	59.3
213.43-2	436	329	71	1.1	1.2	8.20	66.5
213.43-3	434	311	75	2.4	1.4	14.16	66.6
311.43-1	443	336	75	.1	4.0	3.93	73.6
20.44-2	346	272	78	2.7	4.1	2.25	57.6
26.44-1	479	416	87	.4	1.1	1.14	69.6
189.45-6	581	527	90	0	1.1	2.54	65.1
89.46-2	293	239	80	0	3.3	3.17	63.7
127.46-1	427	373	90	.5	1.1	1.23	62.5
Minn. 6	374	295	81	0	3.5	1.06	74.6

Nebraska table 5. Summary of five dryland western Nebraska field trials in 1951 when grown as a late crop.

Variety or line number	Yield per acre		Pct. U.S. #1 or of some defects				Mean specific gravity	Total of rank eight items
	Total	U.S. #1 A size	U.S. #1 A size	Scabby	Rough	Late blight rot		
	Bu.	Bu.	Pct.	Pct.	Pct.	Pct.		
Cayuga	229-5	150-5	65-7	1.7-7	14.0-20	0.3-8	76.4-1	7.6
Kasota	201-13	171-2	73.3	3.9-9	1.8-4	5.5-26	66.3-22	11.3
Katahdin	186-18	113-16	60-14	11.4-16	8.2-17	2.3-22	69.8-9	16.0
LaSoda	253-3	167-4	37-26	12.5-18	6.5-11	5.0-24	67.8-16	14.6
Menominee	247-4	143-8	56-16	2.5-8	15.0-21	1.2-18	69.7-10	12.1
Mohawk	228-6	114-15	56-17	26.2-26	5.6-10	.6-12	71.8-5	13.0
Ontario	175-24	91-24	52-22	0 -4	28.7-25	0 -3	63.5-24	18.0
Pawnee	226-7	138-9	67-6	14.8-22	3.9-6	.5-9	69.7-11	10.0
Progress	217-9	131-11	61-12	4.9-10	7.6-15	0 -1	69.0-12	10.0
Red Pontiac	256-2	177-1	62-11	14.6-21	15.6-22	.2-6	61.6-26	12.7
Rus. Burbank	185-19	71-26	38-25	0 -2	39.0-26	0 -2	70.4-8	15.4
Sebago	176-22	123-12	71-4	0 -3	7.9-16	.5-10	71.3-7	10.6
Seneca	198-15	119-13	58-15	.7-6	17.9-23	.8-14	68.8-13	14.1
Triumph	208-12	107-17	53-21	22.3-25	4.2-7	1.1-17	67.0-18	16.7
White Cloud	225-8	171-3	75-1	8.2-14	3.1-5	0.9-16	73.8-2	7.0
White Rose	209-10	57-27	20-27	.4-5	60.2-26	1.3-19	64.9-23	19.6
120.40-6	198-14	148-6	75-2	5.9-11	5.2-9	.2-5	67.8-17	9.1
59.41-P1	266-1	136-10	55-19	0 -1	27.6-24	.2-7	72.9-3	9.3
20.42-9	167-25	106-18	63-9	10.1-15	13.2-19	.5-11	66.5-21	16.9
204.43-1	179-21	81-25	45-24	32.9-27	1.4.3	.8-15	63.0-25	20.0
209.43-1	196-16	106-19	48-23	19.0-24	1.0-1	9.9-27	66.7-19	18.4
213.43-2	190-17	106-20	56-18	12.5-17	1.3-2	1.9-20	68.3-14	15.4
213.43-3	180-20	115-14	64-8	13.0-20	4.9-8	.8-13	68.5-15	14.0
20.44-2	175-23	97-22	54-20	12.8-19	8.8-18	5.2-25	57.7-27	22.0
26.44-1	209-11	146-7	70-5	6.9-13	7.0-13	4.3-23	71.8-6	11.1
127.46-1	163-27	95-23	60-13	18.8-23	6.8.12	2.2-21	66.7-20	19.9
Minnesota 6	165-26	103-21	63-10	6.4-12	7.4-14	0 -4	72.3-4	13.0
Mean	203.96	121.56	57.67	9.72	11.99	1.71	68.31	

Nebraska table 6. Summary of nine late-crop irrigated trials in western Nebraska 1951.

Variety	Yield per acre		Percentages U.S.#1 or Defects				Mean specific gravity	Dry matter 1/	Total of rank eight items
				Classified Defects					
	Total	U.S. #1 A size	U.S. #1 A size	Scabby	Rough	Late blight rot			
	Bu.	Bu.	Pct.	Pct.	Pct.	Pct.			
ayuga	265-15 2/	170-12	63-15	1.5-6	14.1-21	1.16-5	76.5-1	18.9	10.7
asota	333-5	261-2	73-2	2.0-7	4.9-11	6.32-20	66.8-15	16.7	8.9
atahdin	288-10	174-10	65-11	11-18	4.9-10	3.70-14	75.1-2	18.6	10.7
aSoda	338-4	226-3	64-13	14-21	6.2-15	7.84-23	66.4-16	16.8	13.6
enominee	145-27	89-27	62-16	0-3	17.1-23	1.88-10	64.3-22	16.3	18.3
ohawk	254-17	167-13	61-17	8-15	12.8-20	3.35-12	69.9-10	17.5	14.9
ntario	250-20	157-18	64-14	0-1	15.1-22	.44-2	64.8-20	16.4	13.9
awnee	311-7	163-15	44-26	41-27	3.1-4	5.11-18	70.6-8	17.7	15.0
rogress	288-11	206-6	71-4	5-10	8.5-18	.65-4	69.7-11	17.5	9.1
ed Pontiac	395-1	266-1	67-7	9-16	10.6-19	1.51-6	63.6-25	16.2	10.7
us. Burbank	205-24	97-26	45-24	0-2	26.6-26	1.76-9	71.7-7	17.9	16.9
Sebago	184-25	133-22	65-10	4-9	5.9-14	.58-3	70.0-9	17.7	13.1
Seneca	228-23	162-16	69-5	7-13	8.4-17	.37-1	63.7-24	16.2	14.1
Triumph	339-3	225-4	65-9	14-20	5.2-12	3.94-15	67.6-13	17.0	10.9
White Cloud	291-9	147-19	49-22	33-26	3.6-7	1.71-8	73.2-5	18.2	13.7
White Rose	281-14	118-23	39-27	1-5	29.1-27	15.00-25	63.0-26	16.1	21.0
L20.40-6	283-13	213-5	74-1	3-8	3.2-5	2.28-11	66.4-17	16.8	8.6
59.41-P1	319-6	193-9	60-18	.5-4	24.0-25	4.33-16	66.9-14	16.8	13.1
20.42-9	263-16	144-20	56-20	6-12	17.7-24	7.67-22	66.4-18	16.7	18.9
204.43-1	286-12	194-8	66-8	12-19	4.1-8	5.09-17	63.8-23	16.2	13.6
209.43-1	340-2	199-7	58-19	18-24	4.6-9	8.66-24	64.3-21	16.3	15.1
213.43-2	310-8	165-14	46-23	15-22	1.1-1	31.68-26 3/	74.9-3	18.5	13.9
213.43-3	251-19	108-25	44-25	10-17	2.9-2	35.09-27 3/	72.5-6	18.0	17.3
20.44-2	244-21	138-21	49-21	20-25	7.0-16	5.17-19	59.9-27		21.42
26.44-1	254-18	173-11	72-3	8-14	2.9-3	7.17-21	73.7-4	18.3	10.6
127.46-1	233-22	161-17	67-6	18-23	3.5-6	3.69-13	66.0-19	16.7	15.1
Minnesota 6	174-25	114-24	65-12	6-11	5.9-13	1.55-7	68.4-12	17.2	14.9
Mean	272.30	169.00	60.11	9.89	9.37	6.21	68.15		

1/ Based on table supplied by Stevenson - reporting Maerker and Morgan (1879) and Foth (1907).

2/ Second number of each pair refers to relative rank among the varieties tested.

3/ Included in only 2 plats, and in these late blight rot was exceptionally prevalent.

NEW HAMPSHIRE

Paul T. Blood

The variety yield trials at Durham, N. H., were planted May 16 on a Melrose soil type. The field received 15 tons of manure per acre, plowed down, and 1,900 pounds of a 5-10-10-2 mixed fertilizer, added at planting time. The plots were 30 feet long, replicated three times, with a 1-foot spacing between seed pieces. The total rainfall from April 1 through September was 17.73 inches, and it was well distributed for this growing season. Comparative yields are given in New Hampshire table 1.

New Hampshire table 1. Yield of U.S. 1's and U.S. 2's of a number of varieties and seedlings tested at Durham, N. H., 1951.

Rank	Variety	Yield per acre	
		U.S. No. 1's	U.S. No. 2's
		Bu.	Bu.
1	Kennebec	651.2	28.1
2	Essex	631.5	56.8
3	B 606-67	606.1	43.4
4	B 73-10	572-6	24.6
5	Cherokee	563.5	53.3
6	B 355-44	543.1	25.0
7	Teton	509.1	24.5
8	Madison	508.7	31.6
9	Katahdin	492.0	36.3
10	Ontario	470.2	51.7
11	Chippewa	463.8	45.1
12	Russet Sebago	445.1	30.4
13	B 447-98	443.6	56.3
14	Pawnee	439.0	42.0
15.	Green Mountain	438.0	41.7
16	Russet Burbank	407.9	62.3
17	Yampa	374.1	33.1
18	Cobbler	371.8	107.3
19	Sebago	303.2	46.0
20	B 932-9	299.5	86.8
21	Mohawk	288.1	19.0
22	Russet	286.3	48.1

This was a bad late blight year due to a very wet season, but the resistant varieties came through in fine shape. The six top yielding varieties and seedlings in table 1 are all highly resistant to the common race of late blight. In general, the yields were very good. New Hampshire table 2 gives the specific gravity ratings and percentage of starch for these varieties. It is interesting to note that the Russet Burbank rated sixth in quality and sixteenth in yield.

New Hampshire table 2. Specific gravity and starch content of potato varieties and seedlings grown at Durham, N. H.

Varieties & seedlings	Specific gravity	Starch
		Pct.
B 355-44	1.0784	13.0
Green Mountain	1.0746	12.8
B 932-9	1.0738	12.6
Kennebec	1.0710	12.0
Russet Burbank	1.0708	12.0
B 606-67	1.0702	11.8
Cobbler	1.0699	11.8
B 73-10	1.0699	11.8
Cherokee	1.0682	11.4
Russet	1.0679	11.3
Mohawk	1.0678	11.3
Madison	1.0674	11.2
B 447-98	1.0664	11.0
Pawnee	1.0663	11.0
Houma	1.0647	10.7
Katahdin	1.0633	10.4
Yampa	1.0630	10.3
Teton	1.0622	10.1
Russet Sebago	1.0620	10.1
Essex	1.0616	10.0
Sebago	1.0610	9.9
Chippewa	1.0588	9.4
Ontario	1.0582	9.3

NEW JERSEY

John C. Campbell

Twenty-four varieties and four USDA seedlings were tested for yield on the Spencer Perrine farm at Cranbury, twenty varieties and strains were tested for yield and reaction to irrigation on the Marvin Hulick farm also at Cranbury, and twenty-two varieties and strains were tested for yield on the Ketcham Brothers' farm at Freehold.

The soil in the tests at Cranbury is classified as sassafras loam and at Freehold as collington loam. The plots on the Perrine farm were 100 feet long and two rows wide. The rows were 36 inches apart, and the seed pieces were spaced 10 to 11 inches apart. The varieties were planted in a systematized block design with three replications. On the Hulick farm the two replicates were each 150 feet long and two rows wide, whereas the plots on the Ketcham farm were 300 feet long and two rows wide. The rows on these two farms were 34 inches apart.

A 4-12-8 fertilizer at 2,200 pounds per acre was applied in bands at planting time on the Perrine farm, 2,000 pounds of a 5-10-10 on the Hulick Farm, and 1,500 pounds of an 8-16-18 on the Ketcham farm. Basic Copper and DDT were applied at standard rates for pest control at all locations.

The test at Perrine's was cleared of weeds and vines by the use of a rotobeater 8 days before harvest. The varieties with more than 25% of the vines green were B 355-44, 40-50%; Mohawk, 25-35%; and Kennebec, 20-25%. The Seedling B 355-44 was definitely the latest in maturity at this location. No data were taken on degree of maturity at harvesttime at the other locations.

The rainfall at Cranbury was below average, and four applications of irrigation water were applied on the irrigated area on the Hulick farm. Irrigation was not needed until mid-season and the Cobbler variety was almost mature before irrigation was used, therefore no yield increase was obtained with this variety under irrigation. We cannot explain the fact that the Mohawk, which is a late-maturing variety, did not respond to the applications of irrigation water. The rainfall at Freehold was relatively adequate for a good crop.

It can readily be seen that the use of irrigation greatly increased the yields of most of the varieties.

The highest yields at all locations were produced by one or more Chippewa strains from Starks Farms, Rhinelander, Wis. However, none of them was statistically greater at 5% than Katahdin #50, or either source of Kennebec in the test on the Perrine farm. In this same test the Cherokee variety and the New Jersey source of Cobbler produced significantly lower yields than that for all varieties excepting Canoga, Green Mountain, Madison, Pawnee, Ashworth, and B 637-14.

Chippewa #46 under irrigation produced a significantly higher yield on the Hulick farm than all but the Chippewa #18 and #20, Essex, Canoga, and Katahdin #50 varieties. The New Jersey source of Cobbler produced a significantly lower yield than any other variety.

Chippewa #18 and #20, without irrigation, produced significantly higher yields on the Hulick farm, than all varieties excepting Chippewa #46, Chippewa #1, Chippewa #9, and the New Jersey source of Chippewa. The New Jersey Cobbler variety produced a significantly lower yield than any other variety with the exception of the Madison.

It should be noted that, in general, the Wisconsin sources of Chippewa and Katahdin produced very scabby potatoes. This disease was particularly severe on the Hulick farm. The New Jersey source of Chippewa was also severely infected at all locations, whereas the Maine source of Chippewa developed severe scab only on the Hulick farm. Other varieties severely diseased on the Hulick farm were the Essex, Kennebec, Green Mountain, Mowawk, and Cobbler #60.

The test on the John Schauer farm was planted in mid-summer when our potatoes that are grown for seed purposes are normally planted. The plots varied in size because of the quality of seed available, and the test was planted primarily to produce a local source of seed of the newer varieties. The yields were obtained to get a rough idea of the relative yielding ability of the varieties and no great value is placed on the yield data.

The data for the trials are given in New Jersey tables 1 and 2.

New Jersey table 1. Yield and starch data on potato variety trials made at three locations in New Jersey in 1951.

Variety	Source	Yield per acre												Average total
		Spencer Perrine, Cranbury			Marvin Hulick, Cranbury***			Non-irrigated***			Ketcham Brothers, Freehold***			
		Total	U.S. No.1	Starch	Total	U.S. No.1	Starch	Total	U.S. No.1	Starch	Total	U.S. No.1	Starch	
		Bu.	Bu.	Pct.	Bu.	Bu.	Pct.	Bu.	Bu.	Pct.	Bu.	Bu.	Pct.	Bu.
Chippewa No.46	Wis.	514*	452	10.7	714	254	10.2	558	430	10.7	495	480	12.2	570
Chippewa No.18	Wis.	466*	342	10.7	683	223	----	598	273	----	448	376	11.9	549
Chippewa No.20	Wis.	464*	326	10.5	656	167	----	593	334	----	477	323	11.5	547
Chippewa No.1	Wis.	493*	300	10.7	594	208	----	551	342	----	535	357	11.5	543
Chippewa No.9	Wis.	449*	333	10.7	551	169	10.0	494*	258	11.0	527	287	11.7	505
Katahdin No.50	Wis.	472*	324	12.4	599	275	----	440	159	----	463	337	11.7	493
Essex	Maine	407*	359	11.0	624	472	10.0	487	153	10.7	403	333	11.0	480
Kennebec	Maine	485*	426	12.4	567	461	10.7	414	272	11.9	424	378	12.9	473
Katahdin	Maine	426*	398	11.0	560	321	11.2	452	288	11.7	459	426	12.9	474
Chippewa	Maine	414*	396	11.2	570	131	----	428	226	----	450	405	11.7	466
Teton	Maine	428*	405	11.0	555	499	10.2	463	270	11.5	428	417	11.9	469
Gr. Mountain	Maine	335*	304	14.2	575	455	11.9	485	246	13.2	442	387	14.7	459
Mohawk	Maine	363*	339	12.7	454	389	12.4	459	234	13.2	450	420	13.4	432
Kennebec	Wis.	479*	447	12.4	---	---	----	---	---	----	---	---	----	479
Chippewa	N.J.	394*	299	----	558	417	----	498	404	----	397	332	11.5	462
Cobbler No.60	Wis.	392*	370	12.7	483	248	----	473	419	----	469	424	12.7	451
Cobbler	Maine	407*	384	13.4	467	341	11.7	479	440	11.7	439	410	13.4	448
Canoga	N. Y.	340*	308	12.2	615	565	11.0	455	291	11.5	395	360	12.4	450
Madison	N. Y.	305*	217	13.2	485	368	11.7	302	49	12.2	352	281	12.9	356
Katandin	N. J.	371*	351	----	482	420	----	403	266	----	403	368	11.7	315
Cobbler	N. J.	280*	261	----	286	227	----	270	238	----	286	257	13.2	281
B 355-44	Maine	430**	397	12.9	---	---	----	---	---	----	---	---	----	430
B 351-44	Maine	378**	339	13.2	---	---	----	---	---	----	---	---	----	378
B 73-10	Maine	355**	333	12.4	---	---	----	---	---	----	---	---	----	355
B 637-14	Maine	340**	317	12.4	---	---	----	---	---	----	---	---	----	340
Pawnee	Maine	327*	304	11.9	---	---	----	---	---	----	---	---	----	327
Ashworth	N. Y.	314*	297	11.7	---	---	----	---	---	----	---	---	----	314
Cherokee	Maine	280**	252	14.2	---	---	----	---	---	----	---	---	----	280
Katahdin	Vt.	---	---	----	---	---	----	---	---	----	437	415	----	437
Cobbler	Canada	---	---	----	---	---	----	---	---	----	397	369	----	397
LSD 5%		63			115			102						
LSD 1 %		82			157			140						

* Three replicates each 1/120 acre. ** Two replicates each 1/120 acre, not calculated. *** Two replicates each, 1/240 acre, calculated. **** One replicate 1/60

New Jersey table 2. Varieties tested in the late crop at Englishtown, N. J., in 1951

Variety	Source	Yield per acre	
		Total	U. S. No. 1
		Bu.	Bu.
Katahdin	Maine	236	210
Kennebec	do	196	190
Pungo	do	191	151
McIntyre	Canada	151	121
Ashworth	New York	115	93
Keswick	Canada	111	94

NEW YORK (Cornell)

J. R. Livermore

It is a source of encouragement to the potato breeders that the consumer is becoming interested in the eating quality of the potato. Whether that interest can be translated into willingness to pay higher prices for quality is not yet clear. At the moment the Katahdin seems to be under criticism; the specific desire is for better cooking quality than the Katahdin. If true, this is unfortunate, for the potato grower is well pleased with the variety, judging from the large acerage being grown over the States, particularly in the Northeast. The Katahdin is a sure cropper with a high percentage of salable potatoes.

The Canoga continues to please all those who have tried it. Everyone who has eaten it is enthusiastic about its quality. Our head greenhouse man dug some while the vines were still entirely green and claims that the tubers were mealy when baked. Samples of Canoga from two fields near Ithaca, when tested, showed more than 16 percent starch.

As to its yielding ability, a casual glance at the tabled county yields, within Dr. M. W. Meadows' portion of the New York reports, might cause the reader to think that the Canoga was not much better than average. In Essex County and Erie County, the yield is quite low; just why is not readily explained. On the other hand, Canoga was first among all varieties in Allegany County. Closer scrutiny of that table shows that several of the varieties which averaged above Canoga are of poor cooking quality, for example, Ontario. The very high yields of total bushels of Kennebec and Essex nearly always are made possible by the large number of rough, oversize tubers produced by those varieties. In Dr. Arthur Pratt's county tests whenever the yield estimate was based on bushels of tubers over 2 inches in diameter and under 12 ounces in weight, then the Canoga either equaled or outyielded the Kennebec.

There was less leaf roll in our field potato plots than in any year since the writer started the hybridization program in 1935. It might have been due to a smaller than usual population of insect vectors in 1950, or perhaps to the excellent conditions for indexing in the greenhouse last winter. At that time the leaflets would roll almost as soon as they appeared, if the plants had leaf roll. That condition might be due to the fact that raw field soil, lightened with sand, was used in the pots. At the same time similar stocks were being grown elsewhere in the greenhouse in high-organic-matter potting soil. Those plants grew to be 12 to 15 inches high before the leaflets rolled and even at that time there were plants known to carry the virus that had not yet shown symptoms in the leaves.

Several seedlings were found to be free from leaf roll, both in the greenhouse index tests and subsequently while growing in the field. Only time will tell whether they are actually resistant to the virus. The strain B 24-58, originally obtained from Dr. Donald Folsom, Maine, has been grown in Ithaca over 10 years without showing any leaf roll. Last spring a small sample

was returned to Dr. Folsom; he reported that it was free from leaf roll as grown in Maine in 1951. Needless to say, B 24-58 is used in many of our crosses. At present we have a few highly desirable seedlings with B 24-58 in their pedigree.

The season just passed proved to be a good test for potato leaf-hopper resistance. While it is true that DDT kills the hoppers quite readily, so it killed the housefly at the outset but now has little, if any, effect on them. As new chemicals are found they, in turn, may become harmless. Whatever the end result, breeding for insect resistance will be continued. At the present time we have one seedling that is high yielding and quite resistant to hoppers. The tuber cooks very dry mealy; in fact, too dry for good palatability, over 20 percent starch. Among the new seedlings, being tested in rows for the first time, there were several that were quite normal while all others around them had been killed by the hoppers.

The search for high-yielding, good cooking-quality potatoes is beginning to show results. The specific gravity tests resulted in readings of 1.110, 1.07, 1.109, and so on. In the author's opinion the specific gravity test is not enough in itself to guarantee a good eating potato. Eating quality is the combination of, at least, three factors; namely, starch content, texture of the booked potato, and flavor. Incidentally, it could be that the public will react unfavorably to the use of starch content as a synonym for specific gravity. So many people have been misled into believing that potatoes are fattening that the words "high starch content" might very well turn them against potatoes as a food.

To get back to the new seedlings, there are some that yielded at the rate of 100 to 200 bushels an acre more than the checks. Among these, the specific gravities ranged from 1.110 down to 1.080, and the best eating potato, the most palatable of all those tried, was 1.088, or a little above 15 percent starch. One seedling with specific gravity of 1.095, is high yielding and disease resistant; however, the tuber cooks dry, but quite firm yet not soggy, and it is not pleasing to the palate. Another, with specific gravity of 1.110, cooks dry and mealy but has no flavor and resembles dry flour in the mouth. On the other hand, there are two others with specific gravity readings of 1.086 and 1.080 that cook dry and mealy, are very friable (loose texture), and of excellent flavor. So it is that specific gravity is helpful, but final choice of a high-quality eating potato must depend on cooking tests.

NEW YORK

M. W. Meadows and R. L. Sawyer

Title: Yields and specific gravity of potato varieties and seedlings in New York, 1951.

Project Leaders: M. W. Meadows and R. L. Sawyer.

Importance of Problem: Katahdin continues to be the most popular potato variety in New York State despite its average yielding ability and rather low resistance to scab and late blight as measured by present-day standards. This popularity is not surprising considering the variety's dependability and marketability. It is hoped, however, that a variety can be developed which has all the attributes of Katahdin plus higher yielding ability and greater resistance to some of our more troublesome diseases.

Plan of Work and Locations: A total of 15 varieties and 5 seedlings were tested in 6 counties of up-State New York and 2 counties on Long Island.

Trials consisted of 5 replicates, each replicate consisting of a single row 30 feet long with a seed spacing of 10 inches within the row. In Erie County there were only 4 replicates.

Specific gravity samples were taken from 3 replicates and determination was made by the conventional weight in air weight in water method.

Results: Total yields are given in Meadows table 1 and specific gravity in Meadows table 2.

Of the newer varieties tested Kennebec was the more promising because of its high average yields and high specific gravity ratings.

Placid, one of Cornell's blight-resistant varieties, performed quite well, outyielding Katahdin rather consistently.

Canoga, a Cornell leaf-roll-resistant variety, gave satisfactory results in both yield and specific gravity.

Pungo, despite its high yields, was not too well received because of a high percentage of oversize tubers and a rather undesirable russeting.

Cherokee did not overshadow Irish Cobbler in yield but may have a place because of its attractive tubers and resistance to scab and late blight.

Keswick and Canso produced attractive tubers of high specific gravity but did not produce very high yields.

Canadian Seedling F 451 and F 5419 and Seedling No. 13 are worthey of trial because of their high yields and high specific gravity readings in the one trial where tested.

B 73-10 was not outstanding this year, B 637-14 produced high yields but the tuber is rather unattractive and the specific gravity was rather low.

Meadows table 1. Potato variety trials.

Variety	Yield per acre								Variety average	Percentage of times yield higher than Katahdin
	Nassau County	Suffolk County 1/	Steuben County	Oneida County	Allegany County	Genesee (Muck) County	Essex County	Erie County		
	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Pct.
Essex	744	628	504	---	---	---	408	430	543	100.0
Kennebec	696	496	488	520	464	688	424	402	522	87.5
B 637-14	684	526	448	504	408	688	371	418	503	62.5
Ontario	596	551	560	536	488	---	368	380	497	85.7
Placid	584	520	456	528	472	---	488	400	493	75.0
Houma	672	478	448	---	---	608	352	368	488	66.7
Green Mountain	560	537	536	544	416	---	384	400	482	71.4
Sebago	528	433	384	472	464	768	360	388	481	75.0
Canoga	584	463	504	496	544	656	272	318	480	37.5
Pungo	512	493	448	552	400	648	400	370	478	62.5
Katahdin	690	472	392	408	440	712	280	338	466	
B 73-10	488	442	392	488	408	656	352	394	452	37.5
Cherokee	440	391	464	496	424	704	288	358	446	50.0
Cobbler	520	459	352	464	336	736	304	328	437	37.5
Keswick	392	428	400	488	432	672	312	342	433	50.0
Canso	400	335	376	400	336	744	200	296	386	12.5
No. 13	---	---	---	---	468	---	---	---	464	100.0
King Edward	---	---	---	---	384	---	---	---	384	.0
F451	---	---	---	472	---	---	---	---	472	100.0
F5419	---	---	---	416	---	---	---	---	416	100.0
L.S.D. 19:1	76.0	56.0	86.4	99.2	59.7	N.S.D.	76.8	61.4		
99:1	101.0	75.0	114.9	88.5	79.4		102.1	82.0		

1/ Yield of U.S. No. 1

Meadows table 2. Specific gravity of potato varieties 1/

Variety	County								Variety average	Percentage of times higher than Katahdin
	Nassau	Suffolk	Steuben	Oneida	Allegany	Genesee (muck)	Essex	Erie		
										Pct.
Essex	1.056	1.072	1.070	---	---	---	1.064	1.077	1.068	20.0
Kennebec	1.074	1.074	1.086	1.085	1.084	1.080	1.074	1.090	1.081	100.0
B 637-14	1.065	1.072	1.075	1.075	1.076	1.075	1.074	1.080	1.074	37.5
Ontario	1.063	1.072	1.082	1.076	1.080	---	1.070	1.088	1.076	28.6
Placid	1.065	1.072	1.084	1.077	1.082	---	1.071	1.088	1.077	57.1
Houma	1.065	1.067	1.080	---	---	1.076	1.072	1.089	1.075	33.3
Green Mountain	1.076	1.071	1.089	1.096	1.089	---	1.080	1.103	1.086	85.7
Sebago	1.062	1.069	1.083	1.079	1.087	1.075	1.074	1.084	1.077	37.5
Canoga	1.061	1.070	1.078	1.087	1.088	1.076	1.074	1.096	1.079	62.5
Pungo	1.066	1.069	1.085	1.080	1.086	1.078	1.074	1.069	1.078	62.5
Katahdin	1.064	1.071	1.076	1.080	1.081	1.077	1.072	1.089	1.076	----
B 73-10	1.064	1.068	1.082	1.080	1.080	1.076	1.071	1.093	1.077	25.0
Cherokee	1.062	1.074	1.085	1.079	1.087	1.080	1.072	1.089	1.079	50.0
Cobbler	1.066	1.075	1.077	1.074	1.081	1.081	1.073	1.083	1.076	62.5
Keswick	1.066	1.070	1.084	1.087	1.086	1.081	1.077	1.091	1.080	87.5
Canso	1.069	1.069	1.083	1.084	1.086	1.084	1.074	1.104	1.082	87.5
No. 13	---	---	---	---	1.092	---	---	---	1.092	100.0
King Edward	---	---	---	---	1.081	---	---	---	1.081	.0
F451	---	---	---	1.089	---	---	---	---	1.089	100.0
F5419	---	---	---	1.098	---	---	---	---	1.098	100.0

1/ High reading denotes high starch content. Above 1.080, potatoes are mealy.

NEW YORK

L. C. Peterson and D. Reddick

The Season

The summer of 1951 was peculiar in many respects. Many parts of the State suffered from an excess of moisture at the beginning of the season followed by a drought which lasted until harvesttime. Other sections of the State had an ample supply of moisture throughout the entire growing season. Our seed plots were located in the "dry" part of the State with the result that yields, especially among the early-maturing varieties, were exceptionally low. Late blight never appeared in these plots.

Blight

Approximately 200 crosses were made in the greenhouse this spring. While the major emphasis of this program is placed on the production of blight-resistant varieties, many crosses were made for resistance to scab, leaf roll, and rugose mosaic.

The object of the blight program is to recombine the resistant factors of Solanum demissum. All seedling families were inoculated with races B, C, and D in order to eliminate the susceptible individuals. The immune seedlings were transplanted and grown to maturity in the greenhouse. About 2,500 seedlings were grown in this manner. Approximately 3,000 seedlings were grown this year for the first time in the field. Selections were made on the basis of horticultural characters, and the reaction of these seedlings to races BC and BD is now being determined. Several hundred seedlings immune from all of the now known races of P. infestans were grown for the second time under field conditions and selections were made for further increase.

Scab

About 3,000 seedlings were grown in the greenhouse this year. Many of the seedlings handled under "Blight" possess one or more scab-resistant parents in an attempt to combine resistance to both scab and blight in one seedling. Several hundred scab-resistant seedlings were grown in a scab-conditioned nursery on Long Island. A large number of these seedlings were discarded as being susceptible or too late in maturity. A number were saved for further increase.

Viruses

Intercrossing varieties and seedlings possessing some resistance to leaf roll was continued. Seedlings produced from these crossings were exposed in alternate rows with plants infected with leaf roll. Viruliferous aphids were introduced into the plot, and the aphid population remained high during the season. Tubers were saved from the exposed seedlings and were grown again this year.

An exceedlingly small number of seedlings have survived this treatment without a material increase in leaf roll. A few seedlings were saved for further exposure trials.

A number of seedlings were inoculated in the greenhouse by rubbing with virus Y. On the basis of symptoms, plants were placed into three groups--systemic, no reaction, and necrotic reaction with local lesions. Tubers from plants in the last two groups were saved, grown, and tested for the presence of virus Y. A number of these seedlings proved to be free of the virus. Field-exposure tests were conducted by planting alternate rows of seedlings and tubers infected with virus Y. Seedlings which had survived the inoculations with virus Y and subsequently were found to be free from the virus generally remained free of the virus under field conditions. These tests are being continued with the hope that resistance to virus Y might be incorporated into the breeding program.

Black Spot

Black spot, apparently induced by bruising, consists of a blackening of the tissues under the skin of the tuber which may be scarcely disernible until the tuber is peeled. A large number of varieties and seedlings have been tested for their susceptibility to black spot. A marked variation exists in the reaction of these varieties and seedlings to black spot. A few varieties that vary greatly in their reaction to black spot have been inbred and the seedling progenies have been tested in order to determine whether a correlation exists between susceptibility and mealiness as determined by specific gravity. The results indicate that there is a general tendency for black spot to be less severe in seedlings with the lower specific gravities. Enough variation exists, however, in the reaction of the seedlings with the high specific gravities to black spot to indicate that a high correlation does not exist between these two factors.

NORTH CAROLINA

F. L. Haynes and F. D. Cochran

In the breeding program for this State, particular emphasis is placed on the development of adaptable varieties with market appeal, quality, early to medium maturity, and resistance to such diseases as southern bacterial wilt (brown rot), late blight, and scab. Field work is conducted both in the mountains and in the early areas on the coast, the two principal potato areas of the State.

The mountain plantings for 1951 included approximately 600 breeding lines grown in maintenance, seed increase, and observation blocks; 250 lines were selected for further trial. Selections were made for replicated trial both in the coastal and mountain areas and for observation plantings in the coastal area.

In 1951, field tests in the coastal potato area were planted at four locations. In this area, variety testing and breeding clone evaluation were emphasized. Ninety breeding lines were tested in replicated trials. A few early-maturing lines show superiority in yield and appearance over the early varieties, Cobbler and White Cloud. Several lines of mid-season maturity are promising. The eastern plantings also included observation plots of more than 200 lines. Many of these were selected for replicated trial in 1952.

The results of some of the coastal area trials are presented in N. C. tables 1, 2, 3, and 4. Data for only part of the trials are presented. Many of the plantings were seriously affected by severe drought conditions. The only planting that received adequate rainfall was the trial at Camden (N. C. table 1). Moderate drought conditions prevailed at Plymouth.

As in 1950, Essex was consistently high in yield. It was equaled by Pungo at Plymouth (N. C. table 2).

N. C. table 1. Variety test at Camden, N. C., 1951. Plots 1/125 acre, 4 replications.

Variety	Ave. yield per A U.S. No. 1	Average starch
	Bu.	Pct.
Essex	660	7.95
B 73-10	562	8.80
Chenango	550	9.45
Kennebec	538	9.70
NC 793-14	528	10.10
White Cloud (Neb.)1/	510	9.70
Sebago	465	9.98
White Cloud (N. C.)1/	462	10.10
LaSalle	434	9.45
Irish Cobbler	422	---
L.S.D. 5% level	60	.62
1% level	81	.74

C. V. for yield = 8%, for % starch = 0.21%

1/ Indicates source of seed.

N. C. table 2. Variety test at Plymouth, N. C., 1951. Plots 1/125 acre, 4 replications.

Variety	Ave. yield per A U.S. No. 1	Average starch
	Bu.	Pct.
Pungo	275	11.55
Essex	274	10.72
Kennebec	229	10.95
Irish Cobbler	204	11.94
Sebago	188	9.70
NC 793-14	184	11.55
Chenango	182	9.98
B 73-10	181	9.98
White Cloud	159	12.05
LaSalle	152	11.19
L.S.D. 5% level	39	0.88
1% level	53	1.18

C. V. for yield = 13%; for % starch = 0.3%

N. C. table 3. Breeding clone test 1 at Plymouth, N. C. - 1951
Plot 1/500 acre, 4 replications.

Line	Maturity	Ave. yield per acre U.S. No. 1	Average starch
		Bu.	Pct.
NC 2170-3	L	328	8.79
NC 2416 -43	M	309	11.55
NC 2415-11	M	287	11.55
NC 2403-15	L	280	12.05
NC 2415-3	L	266	10.30
Sebago	ML	262	11.19
NC 2403-55	L	256	10.95
NC 2178-8	L	229	8.56
NC 2403-41	L	221	10.50
NC 2403-53	E	216	12.65
NC 2393-52	L	211	11.19
NC 2170-4	M	208	8.35
NC 2167-27	E	199	10.10
NC 2403-21	M	191	12.05
NC 2416-28	L	172	9.45
White Cloud	E	166	13.55
NC 2178-4	E	161	9.45
NC 2167-25	M	157	10.50
NC 2393-8	M	136	9.00
NC 2392-89	M	135	9.70
Irish Cobbler	E	129	13.30
NC 2392-96	M	124	10.95
NC 2403-25	E	102	10.30
NC 2403-8	L	88	11.19
NC 2178-6	M	73	11.35
L.S.D. 5% level		48	1.59
1% level		63	2.15

C. V. for yield =17%; for % starch = 0.3%

N. C. table 4. Breeding clone test II at Plymouth, N. C. 1951.
Plots 1/250 acre, 4 replications.

Line	Maturity	Ave. yield per acre U.S. No. 1	Average starch
		Bu.	Pct.
Kennebec	L	259	10.10
NC 880-4	L	240	9.98
NC 2167-2	M	230	12.05
NC 2123-12	L	227	10.72
NC 913-2	L	225	9.25
NC 880-8	L	210	9.25
NC 2414-17	L	203	9.98
NC 2390-4	L	202	8.15
NC 2170-1	M	199	10.95
NC 880-7	M	198	8.15
NC 2191-47	E	192	10.95
Sebago	ML	180	9.25
NC 911-6	M	178	8.79
NC 880-3	E	171	8.15
NC 789-9	L	170	8.15
NC 733-4	L	170	11.94
Irish Cobbler	E	153	12.05
B 73-10	ML	152	10.95
NC 2157-2	L	149	9.45
NC 2167-8	L	147	10.30
NC 912-1	ML	132	10.50
NC 2391-5	L	131	8.79
2069	E	121	11.35
White Cloud	E	110	12.44
Chenango	M	100	10.30
L.S.D. 5% level		37	0.86
1% level		50	1.08

C. V. for yield = 15% for % starch = 0.2%

NORTH CAROLINA

L. W. Nielsen

Evaluation of Potato Selections for Resistance to Pseudomonas solanacearum

The various selections and family lines were planted March 15, 1951. Twenty selections that were significantly less diseased than comparative lines in 1950 were planted in a replicated test. Each selection was replicated 5 times in 20-hill plots. The surviving seedlings from the family lines of 1950 were planted at the same time. The number of hills planted with each seedling varied from 1 to 10, but in most cases there were either 3 or 4 hills.

Disease readings were made at weekly intervals, starting May 31 and ending July 16. A fungicide-insecticide dust was applied on each date of reading, with the exception of the last two dates (7-9 and 7-16).

Southern bacterial wilt developed slowly in 1951. As a result, Irish Cobbler (the control) reached maturity before all hills became infected. Late blight was not a problem this year; however, wilting due to Fusarium wilt and southern blight (Sclerotium rolfsii) caused some trouble in taking data.

In reading bacterial wilt, those stems exhibiting wilt symptoms were pulled and subjected to the "ooze" test. If a bacterial "ooze" was forced from the severed underground taproot the remaining stems in the hill were pulled. On the final date of reading, all remaining plants were pulled and given the "ooze" test.

As in previous years, a number of the selections became diseased much more slowly than Irish Cobbler. To illustrate this slower rate of disease development, the data for the last three dates of reading are summarized in Nielsen table 1. For each date of reading the data are the cumulative percentage of diseased hills from all previous readings. July 2 is the last date Irish Cobbler control plants were examined.

Six of the selections were in the significant range for low disease incidence for the last two dates. Two selections 2878 and 2985, were in the significant range of disease incidence on July 9, but the great increase of disease found July 16 removed them from this class for this date of reading. Both selections performed similarly in 1950. Two other selections, 141.1-1 and 3355, fell in the significant range of disease incidence for the last reading, but failed on the July 9 reading. In the case of selection 3355 this was largely due to its intermediate maturity. By July 16, only a few plants were still alive. Both of these latter selections had a fairly high disease incidence on July 2 in contrast with others in the significant range on either of the last two reading dates.

The family lines and the number of seedlings planted from each are indicated in Nielsen table 2. Only three seedlings did not become diseased during the season. However, seedlings in several family lines remained free of symptoms until the last two dates. The number of such seedlings is indicated and they will be more critically evaluated in 1952.

Nielsen table 1. The cumulative percentage of hills that were infected with Pseudomonas solanacerarum at the last three dates of disease reading.

Selection number	Parentage	Cumulative diseased hills on:		
		July 2 1/	July 9	July 16
		Pct.	Pct.	Pct.
B 100-3	Richter's Jubel	5.3	15.82 2/*	40.36 2/*
B 615-6	Mohawk x Teton	67.8	72.36	78.14
141.1-1	Sebago x 245-25	22.2	34.68	53.58*
638	Prisca	9.2	14.54*	50.96*
2777	Pres. x Kat.	12.6	22.72*	47.76*
2801	" "	19.3	39.36	59.60
2823	" "	36.4	55.78	66.80
2866	" "	15.1	38.10	65.92
2878	Gr. Mt. x 336-144	3.6	8.10*	65.58
2909	" "	23.1	36.28	64.12
2928	" "	42.5	59.50	80.78
2983	" "	2.1	15.24*	47.40*
2985	" "	2.1	10.52*	57.56
3027	Houma x 336-144	13.1	37.66	67.76
3192	Earlaine x 46952	19.4	52.16	64.62
3355	96-44 x 336-144	39.5	47.06	49.66*
3746	HoumaxShamrock	63.8	76.88	76.88
3820	Houma x Katahdin	6.8	17.04*	32.64*
3870	1241-91 x 247-48	8.9	36.80	57.52
3874	1276-179 x Shamrock	13.8	23.20*	56.38*
Cobbler		69.4	69.36	69.36
L.S.D. 5%			25.09	24.28

1/ Data not analyzed statistically.

2/ Those marked with asterisk fall in the range of significance.

Nielsen table 2. Wilt resistance performance of family lines. Usually 3 or 4 hills of each seedling were planted.

Family	Parentage	Seedlings planted	Seedlings free of wilt 7-16-51	Seedlings saved for 1952 test
		No.	No.	No.
B 70-4	B 127 x 96-56	1		
B 1241	N.C. 2948 selfed	2		
B 1243	N.C. 3544 selfed	5		1
B 2074	Empire x B 445-41	1		1
B 2117	Sebago x B 355-44	7		2
B 2123	Teton x B 355-44	1		
B 2182	792-94 x B 355-44	2		2
B 2384	B 778-15 x B 582-33	14		6
B 2385	B 779-1 x B 582-33	3		
B 2386	Furore x B 446-58	7		1
B 2389	Teton x B 446-58	1		
B 2390	B 607-37 x B 607-56	4		1
B 2391	B 607-56 x B 355-24	16		1
B 2392	B 607-56 x B 402-1	7		1
B 2393	B 607-56 x B 446-58	7		
B 2394	B 607-72 x B 355-24	3		
B 2399	Kennebec x B 445-41	1		1
B 2403	N.C. 2777 x B 355-24	3		
B 2404	" x B 446-58	1		
B 2405	" x N.C. 2948	8		1
B 2406	" x N.C. 3460	13		1
B 2407	N.C. 2866 x N.C. 2948	11		2
B 2408	N.C. 2866 x N.C. 3460	1		
B 2409	N.C. 2948 x B 355-24	2		
B 2410	N.C. 2948 x B 607-56	25		4
B 2411	N.C. 2948 x N.C. 3460	3		1
B 2412	N.C. 3460 x B 355-24	9		1
B 2413	N.C. 3460 x B 607-56	1		
B 2414	N.C. 3544 x B 355-24	10	1	1
B 2415	N.C. 3544 x N.C. 3460	12	1	3
B 2416	N.C. 3828 x B 446-58	6		
B 2417	N.C. 3828 x N.C. 3460	6		1
B 2441	Ackersegen x Flava	54		1
B 2442	Calrose x Flava	3	1	3
B 2446	Katahdin x Flava	9		2
B 2606	Rod. bl. im. x B 607-72	1		
B 2613	157-9 x Net. Gem. Mut.	2		
B 2614	157-9 x N.C. 2948	1		
B 2620	B 56-11 x B 607-72	1		
B 2624	B 355-24 x Parnassia	57		6
B 2634	B 595-183 x B607-56	1		
B 2636	B 597-2 x B 446-58	1		
B 2649	N.C. 2777 x N.C. 2948	2		1
B 2650	N.C. 2777 x N.C. 3460	1		
B 2651	N.C. 2866 x B 446-58	5		3
B 2653	N.C. 3948 x N.C. 3460	3		
B 2655	N.C. 2948 x B 607-56	1		
B 2656	" " x 157-9	3		
2861	Selfed	1		
B 938	B 30-143 x B 294-38	2		
	Total	343	3	48

NORTH DAKOTA

W. P. Baird

Twenty-six varieties of potatoes were tested at the Northern Great Plains Field Station in 1951, each variety being replicated 5 times in randomized blocks. The results of this test are shown in North Dakota table 1. Potatoes were planted on May 7 and dug on October 1. Weather conditions were favorable except for the severe hail storm on August 16, and yields were above average for dry land. The first killing frost occurred on the night of September 23.

North Dakota table 1. Potato variety test at the Northern Great Plains Field Station, Mandan, North Dakota.

Variety	Average yield U.S. No. 1 per acre	No. 1 compared with total	Starch
	Bu.	Pct.	Pct.
White Rose	275	98	13.4
Sequoia	242	97	15.2
Kennebec	233	94	14.8
Pontiac	231	93	11.9
Chippewa	206	87	11.2
Earlaine 2	206	90	10.5
Mohawk	202	95	14.2
Erie	193	89	16.4
Irish Cobbler	192	94	15.4
Warba	192	94	14.4
Norkota	185	85	13.5
Red Warba	183	91	13.5
Russet Rural	182	88	16.4
Pawnee	179	88	13.1
Katahdin	171	87	12.4
Sebago	169	92	12.7
Rural New Yorker	168	92	18.0
46952	166	92	12.0
Teton	161	88	13.1
Houma	160	83	14.2
Progress	158	74	12.9
Green Mountain	155	84	13.7
Earlaine	154	90	12.9
Miraba	149	89	13.9
Triumph	144	86	12.9
Kasota	124	86	13.4

L.S.D. - - 5% - - 43 bu. - - 1% - - 57 bu. Spacing rows 3½'; hills 18"
Plots 37½' long. 25 hills to plot.

NORTH DAKOTA

Wm. G. Hoyman

The varieties Kennebec, Cherokee, Russet Burbank, Ontario, and Snowdrift were included in the 1951 scab nursery at Fargo along with 20 USDA, 2 Iowa, and 2 North Dakota selections. Excess rain during August flooded the scab plot, and all the tubers rotted in the soil before it was possible to obtain scab readings.

Kennebec, Cherokee, Red Pontiac, and the selections B 515-2 and B 738-8 were increased at Northwood where the soil was known to produce severe scab on Triumphs. N. Dak. table 1 shows the scab readings on the Northwood plot. Cherokee had type 3 lesions but only a few tubers were infected. Kennebec, Red Pontiac, and B 738-8 each had a large percentage of the tubers with lesions. B 515-2 continues to show a high degree of scab resistance in North Dakota.

N. Dak. table 1. - Scab readings on the Northwood increase plot.

Variety	Amount of scab	Type of scab
Kennebec	3	4
Cherokee	3	3
Red Pontiac	1	5
B 515-2	0	0
B 738-8	4	5

In order to test the reaction of seedlings and varieties to field infection of virus Y, they were planted in alternate rows with ND530 in 1950. ND530 is a carrier of virus Y, and tests have shown it is 100 percent infected. Tubers harvested in 1950 were planted in 1951, and the results are given in N. Dak. table 2. It is possible the virus-Y symptoms were masked in those potatoes showing no visible symptoms.

N. Dak. table 2. Reaction of seedlings and varieties exposed to field infection of virus Y.

Name	Plants	Virus Y symptoms	Type of symptom	Infected
	No.	No.		Pct.
B 524-53	100	99	Moderate crinkle	99
B 1172-14	116			
B 2067-10	124	124	Slight crinkle	100
B 2067-52	61			
B 2068-23	89			
Kennebec	513	31	Crinkle	6
Snowdrift	91			

In addition to the field-exposure test, Y-carrying green peach aphids were placed on certain selections and varieties during 1950. The Y-carrying aphids were cultured on ND530 before being transferred to the potatoes listed in N. Dak. table 3. Not less than 75 aphids were placed on each plant. Tubers harvested from these plants were planted in 1951, and the results are shown in N. Dak. table 3. Those showing no visible infection may have had the symptoms masked. The results in N. Dak. tables 2 and 3 agree remarkably well with respect to the percentage of infection exhibited by the potatoes showing visible symptoms. Kennebec had a high degree of resistance, which agrees with observations for the past 4 years.

N. Dak. table 3. Reaction of seedlings and varieties to Y-carrying aphids.

Name	Plants	Virus Y symptoms	Type of symptom	Infected
	No	No.		Pct.
B 524-53	28	26	Moderate crinkle	93
B 738-8	27			
B 1172-14	28			
B 1172-34	25			
B 2067-10	36	36	Slight crinkle	100
B 2067-52	34			
B 2068-23	29			
ND457	32			
Kennebec	50	3	Crinkle	6
Snowdrift	42			

ND457 is a North Dakota selection obtained from Harold Mattson. Mr. Mattson has grown this selection for several years adjacent to stock infected with virus Y. To date, there is no report from North Dakota indicating it produces recognizable virus-Y symptoms in the field or greenhouse. Ten of the ND457 plants in N. Dak table 3 were indexed on tobacco and the test was negative but more thorough tests will be conducted with the tubers to learn if they are free of virus Y.

An attempt was made to find a more suitable indicator plant for virus Y. Approximately 150 different plants were tested in the hope of finding a new local lesion indicator but the results were negative.

Foundation potato seed free of virus X and other viruses was furnished to 15 growers. Gomphrena globosa continues to be a very satisfactory indicator plant for virus X. Among the virus-free seed stock was B 515-2, a russet that has looked quite promising until this year when it growth-cracked badly. Approximately 5,400 pounds of B 515-2 was distributed to 10 foundation growers.

From the collection of seedlings obtained from Dr. F. J. Stevenson in 1949, B 2336N1, B 2368N1, B 2399N2, and B 2425N5, remain and will be tested further. Of these, B 2336N1 has shown the most promise in North Dakota.

A collection of seedling tubers from the Beltsville greenhouse was planted in an isolated plot at Northwood in soil known to cause severe scab on most varieties. The 4,859 tubers represented some of the progeny from 30 families. Fifty-four hills, representing 17 families, were harvested to replant in 1952.

Approximately 300 seedlings were obtained from Chapman Farm during September, 1951, to test for adaptation in North Dakota.

In cooperation with Dr. C. E. Peterson of Ames, Iowa, an isolated plot containing a few hundred seedlings and varieties was grown at Northwood.

Further research was conducted to determine the factor or factors causing xylem discoloration in tubers harvested from vines killed with chemicals or mechanical methods. The 1951 results confirm previous work that drought previous to killing is a cause of this condition. Early killing is another factor causing discoloration, as well as the rapidity of kill. More discoloration is generally present in tubers harvested from vines that were killed rapidly.

NORTH DAKOTA

J. H. Schultz and R. H. Johansen

1. Project: Breeding Potatoes for North Dakota

2. Project leaders: J. H. Schultz and R. H. Johansen

3. Importance of the problem: The principal table-stock potato varieties grown in North Dakota at present are Irish Cobbler, Triumph, Pontiac, and Red Pontiac. While these varieties have serious deficiencies, there is little likelihood of their being replaced by any of the present named varieties. There is a great need for improved early varieties having good horticultural characteristics, quality, disease resistance, and preferably red tuber color.

4. Objects:
   a. To develop improved potato varieties through breeding.
   b. To test the adaptability and value of new potato varieties and selections to North Dakota conditions.
   c. To maintain disease-free breeding stocks and selections.

5. Plan of work and locations: New seedlings were grown from crosses made in the greenhouse and from seed received from cooperators. Selections for desirable types were made in field plantings grown in isolation at the Langdon Experiment Station, and advanced selections were tested in plantings on the research farm of the Red River Valley Potato Growers' Association, Grand Forks, N. Dak. Variety-yield trials were grown at Fargo and Grand Forks and in cooperation with NDAC Experiment Station superintendents at Langdon, Minot, and Williston.

6. Results to date:

State-Wide Potato-Variety Trials

During 1951 the varieties Cherokee, Cobbler, Kennebec, Red Pontiac, Triumph, B 515, ND 457, and Colorado Seedling 6316 were grown in yield trials at six locations in North Dakota. Trials were located at Fargo, Grand Forks, Langdon, Minot, and with and without irrigation at Williston. The latter four trials were in cooperation with the respective branch experiment station and the Grand Forks trial was in cooperation with the Red River Valley Potato Growers' Association.

The trials were planted as randomized blocks with 4 replications of 25 hills each per variety. No fertilizer was used in these trials. Yields are reported in Schultz table 1 and specific gravity in Schultz table 2.

Kennebec was again the highest yielding variety in the North Dakota trials but there is only limited interest in the variety by commercial growers of table-stock potatoes.

Cherokee has yielded well in North Dakota. When grown in heavy soil it becomes very bumpy and irregular, this being one of its principal defects here.

Schultz table 1. Total yield in bushels per acre and average percentage of U.S. No. 1 potatoes grown in yield trials at six locations in North Dakota during 1951.

Variety	Total yield per acre at:							Ave. U.S. #1
	Fargo	Grand Forks	Langdon	Minot	Williston Dryland	Williston Irrigation 1/	Ave.	
	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.		Pct.
Kennebec	890	334	292	396	146	373	407	92.8
Red Pontiac	816	256	286	362	149	381	375	92.9
Cherokee	777	297	284	354	155	327	366	89.6
Triumph	685	292	226	318	146	271	323	93.2
ND 457	588	265	211	270	122	302	293	91.9
Cobbler	661	220	160	205	131	283	277	91.4
C. S. 6316	523	214	207	229	110	258	257	94.4
B 515	506	218	171	218	112	293	253	78.6
Average	681	262	230	294	134	311	319	90.6
L.S.D. 5%	136	69	34	62	31	63	36	
1%	185	94	46	85	42	85	48	

1/ Irrigated on June 1 and 27.

Schultz table 2. Specific gravity of potato varieties grown in yield trials at six locations in North Dakota during 1951.

Variety	Specific gravity 2/						
	Fargo	Grand Forks	Langdon	Minot	Williston Dryland	Williston Irrigation 1/	Ave. 6 locations
ND 457	1.083	1.083	1.080	1.089	1.081	1.087	1.084
Cobbler	1.077	1.079	1.077	1.084	1.082	1.083	1.080
C.S. 6316	1.083	1.086	1.074	1.084	1.075	1.080	1.080
Cherokee	1.076	1.079	1.077	1.073	1.074	1.084	1.077
Kennebec	1.075	1.068	1.077	1.076	1.058	1.079	1.072
Triumph	1.068	1.070	1.070	1.073	1.070	1.075	1.071
B 515	1.065	1.067	1.069	1.069	1.069	1.077	1.069
Red Pontiac	1.065	1.065	1.071	1.074	1.060	1.078	1.069
Average	1.074	1.075	1.074	1.078	1.071	1.080	1.075

1/ Irrigated on June 1 and 27.
2/ Specific gravity determined November 7 and 8 on tubers from one replication at each location using the National Potato Chip Institute potato hydrometer.

ND 457 continues to show promise. It retains remarkably good tuber type under very heavy and cloddy soil conditions. Under North Dakota conditions it continues to show at least field resistance to virus Y. It is somewhat subject to hollow heart but less so than Cobbler.

C. S. 6316 did not yield too well but merits attention for scab resistance and quality.

B 515 made its poorest showing to date in North Dakota during 1951. Growing conditions were exceptionally favorable for second growth, and this selection responded with very severe growth cracks. It may still become a useful variety if given special handling. Resistance to common scab is noteworthy.

Red Pontiac was grown in preference to Pontiac because of the better red color of the former. Our breeding results and other tests have indicated that Red Pontiac is a periclinal chimaera. Reversion to the parental Pontiac seems to occur and the need for tuber selection for red color is indicated in commercial plantings.

North-Central Regional Uniform Potato Variety Trial

In cooperation with potato breeders from the North Central States of Iowa, Michigan, Minnesota, Nebraska, and Wisconsin, a uniform potato variety trial was grown at Grand Forks, North Dakota. The results from this trial are being reported cooperatively by the North-Central States.

Potato Crosses and Greenhouse Seedlings

Most of the parental material used in potato crosses in 1951 had a high degree of resistance to Y virus, common scab, and late blight. ND 457, which has shown field resistance to virus Y, was used in many of the crosses.

All seedling families that had late-blight resistance were artificially inoculated with late-blight spores before transplanting to the greenhouse benches. By a similar method of inoculation a few seedling families segregating for resistance to virus X were inoculated with ring spot X virus. Plants showing symptoms were rouged out of the seedling flats before transplanting, and later when symptoms showed on plants growing in the greenhouse benches. Approximately 22,000 seedlings were grown in the greenhouse in the fall of 1951.

First-year Field Seedlings and Advanced Selections

Approximately 23,000 seedlings of 216 crosses and 9 North Dakota inbred families were grown for field selection of which 151 were North Dakota Station crosses, 26 were USDA crosses, and 16 were Iowa crosses. USDA and Iowa seedlings were grown from seed received from Dr. F. J. Stevenson and Dr. C. E. Peterson, respectively. At harvesttime approximately 800 clones were selected, and these were reduced to 204 after further examination and testing while in storage. Potato scab was found throughout the planting. This made it possible to abandon seedling hills that showed scab.

Second-year selections of North Dakota, Nebraska, Iowa, USDA, and Manitoba and North Dakota inbred families were grown at Langdon and Grand Forks as a 5-hill planting. Thus a 5-hill planting of each selection was grown under isolation at Langdon, and if enough tubers were available a duplicate planting was grown at Grand Forks. At harvest 73 selections were saved for further planting. Thirty older North Dakota selections were grown in 25- to 100-hill plantings at Langdon and Grand Forks. All tubers planted at Langdon in 1951 were tubers indexed in the greenhouse prior to planting. Six selections were saved at harvest for further increase and study. Sixty Iowa, 12 Minnesota, 13 Nebraska, and 40 USDA selections were grown at Grand Forks for observation.

Advanced selections ND 457 and 1300-4 were grown in a 1-acre planting at Grand Forks. ND 457 maintained its field resistance to Y virus during 1951.

OHIO

J. P. Sleesman

1. Project title: Purnell 76. Evaluating insect resistance in varieties and strains of potato.

2. Project leader: J. P. Sleesman.

3. Importance of the problem: The potato leafhopper causes a greater reduction in the yield of potatoes in Ohio than that from any other pest attacking the foliage.

4. Objectives: To develop a variety of potato that combines insect resistance with desirable horticultural qualities. Insect resistance should be combined with resistance to late and early blight if the grower is to receive maximum benefit from the breeding program.

5. Plan of work: Materials to be used are unselected progenies, selected seedlings, and wild species.

   Data will be obtained on insect populations, insect injury, yield, and tuber quality.

   To maintain disease-free seed stocks of selected seedlings.

6. Location: Wooster, Ohio.

7. Results: Approximately 3,500 first-year seedlings received from Drs. Stevenson and Peterson were grown at Wooster. Data on hopperburn injury to these progenies are presented in Ohio table 1. Of the seedlings 8 percent were saved for planting in 1952. Progenies from crosses involving B 478-1, B 724-1, and B 724-15 showed the most resistant seedlings.

   Approximately 120 seedlings selected in previous years were grown in 50-foot plots on upland soil at Wooster and Marietta and on muck soil at Celeryville. A number of the seedlings produced good yields in comparison with Katahdin and Kennebec, and several of them were higher in starch content. Data on yields, starch content, leafhopper populations, and maturity for 23 of the best-performing seedlings in this group are summarized in Ohio table 2. In general, the seedlings that were the most resistant to the potato leafhopper were late in maturing, gave poor yields, and the tubers were low in starch content. The seedling that gave the highest specific gravity reading was the most susceptible to scab.

Three hundred sixty seedlings selected from unselected progenies grown in 1950 were planted in 10-hill plots in 1951. Of these seedlings 10 percent were saved for planting in 1952.

Seventy-five Solanum introductions (wild species) received from Dr. Hougas were planted in the field in replicated plots. Each lot was evaluated for resistance to the potato leafhopper and the potato flea beetle. A number of the species were highly resistant to the leafhopper but most of them appeared to be susceptible to the flea beetle.

Ohio table 1. Reaction of progenies of different crossed to leafhopper injury (hopperburn) at Wooster, Ohio. 1951.

Pedigree No.	Parentages	Seedlings tested	Seedlings placed in several classes of hopperburn 1/				
			1	2	3	4	5
		No.	Pct.	Pct.	Pct.	Pct.	Pct.
B 3103	Mohawk x B 402-1	27	0	48	22	15	15
B 3113	B 478-1 x B 929-6	100	3	24	40	26	7
B 3122	B 583-67 x B 872-70	146	0	9	29	37	25
B 3139	B 607-56 x B 402-1	198	1	14	32	26	27
B 3145	B 724-1 x B 778-43	144	14	31	40	15	0
B 3146	B 724-15 x B 872-10	87	4	18	46	25	6
B 3210	B 478-1 x Earlaine	151	0	16	45	32	7
I 951	B 874-25 x 1712-1	28	0	0	11	29	60
I 953	B 899-3 x B 96-56	27	0	0	0	8	92
I 971	X 26-8 x B 67-11	79	0	0	1	28	71
I 978	1712-1 x B 96-56	81	0	1	1	21	77
I 979	B 762-46 x M 113.43	102	0	2	6	32	60
I 980	Triumf	32	0	0	9	28	63
I 981	1707-1 x 1710-1	91	0	1	8	40	51
I 985	1710-1 x 1781-1	67	0	0	0	42	58
I 991	1712-1 x 1710-1	75	0	0	0	17	83
I 992	1712-1 x 1781-1	91	0	0	3	43	54

1/ Classes of hopperburn: 1 = 0 to 10%
2 = 10% to 25%
3 = 25% to 50%
4 = 50% to 75%
5 = 75% to 100%

Ohio table 2. Yield, starch content, leafhopper populations, and amount of hopperburn for 25 varieties and seedlings of potato. 1951.

Seedling or variety	Yield per acre			Starch	Leafhopper nymphs per leaf	Hopperburn July 26	Dead foliage Aug. 22
	Wooster	Marietta	Celeryville	Wooster			
	Bu.	Bu.	Bu.	Pct.	No.	Class 1/	Pct.
OI 891-1	376	379	491	14.6	4.5	3	90
OI 877-1	369	290	556	15.2	7.0	3	90
OI 878-1	311	196	512	13.4	7.9	1	70
OI 8131-1	470	348	469	14.2	4.3	3	90
OI 8131-2	322	237	382	14.7	4.6	3	90
OI 8131-3	275	300	382	12.7	7.9	2	100
OB 2349-1	329	175	436	11.5	5.3	2	100
OB 2421-1	340	291	632	13.4	10.5	2	70
OB 2421-2	264	190	610	11.9	8.6	2	70
OB 2422-1	362	220	600	11.2	12.4	2	90
OB 2422-2	228	230	567	14.2	11.1	3	80
OB 2422-3	290	402	545	15.2	6.8	3	90
OB 2423-1	308	117	425	13.4	9.6	2	40
OB 2423-2	380	250	273	13.4	2.4	1	10
OB 2425-1	246	195	327	12.9	11.4	3	90
OB 2586-1	380	292	501	11.9	4.5	2	90
OB 2586-2	253	271	610	11.2	7.8	1	30
OB 2586-3	290	304	600	11.2	3.9	2	60
OB 2586-4	362	344	567	12.9	6.3	2	90
OB 2586-5	405	377	600	13.1	7.3	2	100
OB 478-1	268	204	545	13.4	1.7	1	50
OB 606-10	362	215	545	13.4	2.7	2	70
OB 639-2	282	123	273	14.2	10.5	3	80
Kennebec	297	---	491	13.4	10.3	3	90
Katahdin	221	---	349	13.9	10.9	3	60

1/ See footnote Ohio table 1.

PENNSYLVANIA

J. S. Cobb

Three groups of varieties were tested for yield and specific gravity at Pennsylvania State College in 1951. The data for these tests are given in Cobb tables 1, 2, and 3.

The yields are low, partly because July, August, and September were very dry. Manure and clover sod were plowed down on a stony loam soil. Fifteen hundred pounds of 5-10-10 fertilizer per acre was placed in bands alongside the seed pieces by a good planter.

The yield and dry-matter data for a group of early or medium-early varieties are given in Cobb table 1.

Cobb table 1. Yield and dry-matter data for a number of early or medium-early varieties at State College, Pa., 1951.

Variety	Source of seed	Ave. yield per acre	Average Sp. Gr.	Dry matter
		Bu.		Pct.
Irish Cobbler	New York	220	1.0918	22.2
Madison	New York	201	1.0867	21.2
Chenango	New York	251	1.0794	19.7
Bliss Triumph	New York	211	1.0725	18.2
Red Warba	New York	188	1.0849	20.7
Bliss Triumph	Maine	219	1.0712	17.9
Early Ohio	Wisconsin	184	1.0757	18.9
Chippewa	New Work	281	1.0708	17.7
Chippewa	Maine	266	1.0792	19.5
L.S.D. 5%		36 bu.		
L.S.D. 1%		48.7 bu.		

Chippewa grown from New York seed was the highest yielder. It was significantly higher than all others except Chippewa, from Maine seed, and Chenango. Chippewa was not as high in dry-matter content as Irish Cobbler, Madison, or Red Warba but the Chippewa grown from Maine seed was about high enough for baking purposes.

The yield and dry-matter data for a group of late varieties compared with Russet Rural are given in Cobb table 2. None of the varieties in this test outyielded the Russet Rural grown from Potter County seed except Green Mountain, grown from Maine seed.

The dry-matter content of all the varieties in this group was high enough to qualify the tubers as bakers.

Cobb table 2. Yield and dry-matter data on a number of late varieties compared with Russet Rural at State College, Pa., 1951.

Variety	Source of seed	Ave. yield per acre	Average Sp. Gr.	Dry matter
		Bu.		Pct.
Houma	New York	286	1.0808	19.7
Marygold	Maine	219	1.0837	20.4
Green Mountain	Maine	312	1.0821	20.2
Green Mountain	New York	289	1.0836	20.4
Mohawk	Maine	250	1.0879	21.4
Katahdin	Maine	277	1.0857	20.9
Katahdin	E. S	248	1.0826	20.2
Snowdrift	Potter	219	1.0781	19.3
Russet Rural	Potter	243	1.0788	19.4
Russet Rural	Michigan	219	1.0872	21.2
L.S.D. 5%		52.4 bu.		
L.S.D. 1%		70.8 bu.		

Among the group of late varieties of potatoes the data for yields and dry-matter content, of which are given in Cobb table 3, Kennebec and Teton, and Sequoia grown from Maine seed, are the only ones that outyielded White Rural significantly but none of the others yielded significantly less than White Rural. The dry-matter content of all varieties, with the possible exception of Essex, was high enough to insure satisfactory cooking quality.

Cobb table 3. Yields and dry-matter data of a number of late varieties of potatoes in comparison with White Rural at State College, Pa., 1951.

Variety	Source of seed	Ave. yield per acre	Average Sp. Gr.	Dry matter
		Bu.		Pct.
White Rural	New York	225	1.0780	19.2
Sebago	New York	214	1.0766	18.9
Essex	New York	256	1.0693	17.4
Essex	Maine	267	1.0660	16.7
Kennebec	New York	297	1.0792	19.5
Kennebec	Maine	327	1.0783	19.4
Ontario	New York	269	1.0830	20.4
Ontario	Maine	247	1.0774	19.2
Teton	Potter	290	1.0727	18.2
Sebago	Maine	202	1.0747	18.5
Sequoia	New York	264	1.0817	20.0
Sequoia	Maine	295	1.0778	19.2
Canus	Canada	253	1.0758	18.8

L.S.D. 5% 48.2 bu.
L.S.D. 1% 64.2 bu.

PENNSYLVANIA
(Bureau of Plant Industry)
(Pa. Dept. of Agr.)
R. E. Hartman

Wart Immunity Tests, 1951

U. S. Department of Agriculture Seedlings & Named Varieties

The report of wart-immunity studies on the 29 seedlings and named varieties is submitted in the following discussion and Hartman tables 1 and 2.

1. Seedling Numbers and Parentage
2. Germination, Vine Growth, Maturity, Wart Susceptibility, and Yields.

This year's test of wart immunity of seedlings and named varieties was made in heavily infected soil at Bernice, Sullivan County. The area has an altitude of 2,000 feet with a cool, moist climate.

The season was extremely dry and cool, not a favorable one for wart development. The drought caused severe early yellowing with 50% of leaf surface yellowed by August 1, and all vines dead September 1, 1951.

Summary of Wart Reaction: Of the 29 seedlings and named varieties tested, 15 showed infection and 14 were immune, or at least showed no infection this season. Of the 29 checks, 10-row hills of susceptible Russet, 24 were infected and 5 showed no infection. The percentage of infection in the checks as a whole was low. Of a total of 263 check hills 90 were infected, or approximately 35%. In past years in the same infected plots, infection was found in 70 to 90% of check hills.

The seedlings listed below should be rechecked in 1952 and all other additional new seedlings considered promising. Probably this phase of our wart studies will be discontinued in 5 years.

B 73-2	B 402-1	B 922-6	B 2067-97
B 73-3	B 721-1	B 991-13	
B 73-18	B 911-10	B 991-6	
B 73-10		B 991-14	

Hartman table 1. U. S. Department of Agriculture seedlings and named varieties, seedling number and parentage, used in the wart-immunity tests, 1951.

Row No.	Name or Number	Parentage of Seedling
1	Kennebec	B 127 x 96-56
2	Ontario	R. Jubel x 44537
3	Calrose	Ackersegen x Katahdin
4	Pontiac	Triumph x Katahdin
5	Chisago	Minn. Sdlg.
6	B 73-2	Mohawk x 96-56
7	B 73-3	Mohawk x 96-56
8	B 73-10	Mohawk x 96-56
9	B 73-18	Mohawk x 96-56
10	B 294-22	Houma x 96-56
11	B 402-1	499-a x 528-349
12	B 579-11	B24 -58 x Katahdin
13	B 605-19	Pungo x 96-56
14	B 721-1	Earlaine x Teton
15	B 721-35	Earlaine x Teton
16	B 725-8	336-18 x Teton
17	B 738-16	Katahdin x Cherokee
18	B 920-7	B 401-3 x B 355-44
19	B 911-10	055 x Teton
20	B 922-3	T15 x B 355-24
21	B 922-5	T15 x B 355-24
22	B 922-6	T15 x B 355-24
23	B 926-9	B66-1 x 792-94
24	B 962-16	B81-4 x 245-186
25	B 991-6	B355-24 x B81-40
26	B 991-13	B355-24 x B81-40
27	B 991-14	B355-24 x B81-40
28	B 2160-21	B381-2 x 1579
29	B 2067-97	Chippewa x B381-2

Hartman table 2. Harvest record of U.S.D.A. seedlings and named varieties, in wart-immunity test, 1951. Harvested Sept. 21, 1951.

Seedlings and varieties						10-row hills of susceptible Russet check				
Row No.	Seedling or variety	Hills	Hills warted	Yield	Vine growth	Maturity	Hills	Hills warted	Yield	Vine growth	Maturity
		No.	No.				No.	No.			
1	Kennebec	10	None	High	Good	Late	8	4	Medium	Good	Late
2	Ontario	8	None	High	Good	Late	10	6	Medium	Fair	Late
3	Calrose	9	None	High	Good	Late	8	3	Medium	Fair	Late
4	Pontiac	10	2	High	Good	Late	10	1	Medium	Fair	Late
5	Chisago	10	None	High	Good	Late	8	2	Medium	Fair	Late
6*	B 73-2	7	None	Medium	Fair	Late (Scabby)	10	None	Medium	Good	Late
7*	B 73-3	6	1	Poor	Poor	--	9	3	Medium	Good	Late
8*	B 73-10	6	None	High	Good	Late	10	3	Good	Good	Late
9*	B 73-18	7	1	Medium	Fair	Late	7	4	Medium	Fair	Late
10*	B 294-22	8	None	Medium	Fair	Late	10	None	Poor	Fair	Late, V. scabby
11*	B 402-1	10	None	High	Good	Late	8	8	Good	Good	Late
12	B 579-11	10	2	Medium	Fair	Late	10	None	Good	Good	Late
13	B 605-10	10	5	Medium	Fair	Med. Late	10	4	Good	Good	Late
14*	B 721-1	8	None	High	Good	Med. Late	7	4	Medium	Fair	Late
15	B 721-35	9	6	Medium	Fair	Med. Late	10	5	Good	Good	Late
16	B 725-8	8	2	High	Good	Late	10	6	Good	Good	Late
17	B 738-16	9	3	Medium	Good	Late	9	6	Good	Good	Late
18	B 920-7	10	7	Poor	Poor	Early	8	1	Good	Good	Late
19*	B 911-10	10	1	High	Good	Late	10	None	Good	Good	Late
20	B 922-3	9	1	Medium	Fair	Med. Late	7	1	Medium	Good	Late
21	B 922-5	10	6	Medium	Fair	Med. Late	10	3	Medium	Fair	Late
22**	B 922-6	8	1 (?)	Medium	Fair	Med. Late	10	4	Good	Good	Late
23	B 926-9	10	4	High	Good	Late	8	None	Good	Good	Late
24	B 962-16	10	9	Medium	Fair	Med. Late	10	4	Good	Good	Late
25*	B 991-6	9	1	Poor	Poor	Early	10	6	Good	Good	Late
26*	B 991-13	10	None	Medium	Fair	Med. Late	7	3	Medium	Fair	Late
27*	B 991-14	8	None	Poor	Poor	Early	10	3	Medium	Fair	Late
28*	B 2160-21	10	None	Poor	Poor	Early	9	2	Medium	Fair	Late
29*	B 2067-97	8	None	Poor	Poor	Early	10	4	Medium	Fair	Late

* - Retest 1952

** - Very questionable infection, recheck 1952.

PENNSYLVANIA

W. R. Mills

The weather in 1951 was not conducive to late blight in Pennsylvania and neither was it conducive to potatoes in the northern half of the State, where yields were the lowest of any time during the past several years. Rainfall at State College averaged about 1 inch per month for July, August, and September, and less than one-half inch in each of August and September in Potter County, the principal northern seed county.

The Present Status of Races of *Phytophthora infestans*
(In cooperation with L. C. Peterson, Cornell University)

All of the recently named blight-resistant varieties are susceptible to *P. infestans* race D. Since 1949 race D has been increasing rapidly, and Pennsylvania growers now spray Essex, Kennebec, etc. just as any susceptible variety.

We have reported in the past that *Solanum demissum* possesses three major genes for blight resistance labeled B, C, and D, each one of which produces immunity to the field race (race A). Races have been developed which are specific in action against each gene. Thus plants carrying gene B are susceptible to race B, but immune to races C and D. A similar relationship exists between genes C and D and their corresponding races (Mills table 1).

Mills table 1. Reaction of plant genotypes to races of *Phytophthora infestans*

Plant Gene	Race A	B	C	D	BC	BD	(CD)[1/]	(BCD)[1/]
bcd	S	S	S	S	S	S	S	S
Bcd	i	S	i	i	S	S	i	S
bCd	i	i	S	i	S	i	S	S
bcD	i	i	i	S	i	S	S	S
BCd	i	i	i	i	S	i	i	S
BcD	i	i	i	i	i	S	i	S
bCD	i	i	i	i	i	i	S	S
BCD	i	i	i	i	i	i	i	S

1/ Hypothetical races that have not been found. Plant reactions postulated according to behavior with known races.

It is apparent from table 1 that crosses that combine any two blight-conditioning genes produce immunity to all of the "single" races. Because of the manner in which the "single" races are produced (see Reddick and Peterson, Report National Potato-Breeding Report 1949) it appeared probable to us that a further development of races would take place on plants carrying the combination of genes.

Genotypes of plants with more than one immunity factor may be represented in abbreviated form as BCd, BcD, bCD, and BCD. "Combination" races BC, BD, CD, and BCD were postulated. As race BCD would possess virulence factors for each resistance gene found in demissum, it was expected that all progeny of S. demissum x S. tuberosum, and perhaps demissum itself, would be susceptible to race BCD.

Races BC and BD were readily developed in the greenhouse by approperiate host passage (race B through senescent "C" plants and vice versa; race D through "B" plants). Race BD has been isolated repeatedly from the breeding plot and race BC was positively identified in the seedling plot at State College in 1950. However, race BC, first developed in the laboratory in 1948, was used in routine testing for 2 years previous to its first identification in nature.

During the past several years we have inoculated hundreds of plants with each of the six races, and the relationship expressed in table 1 has invariably held true. We have not, however, isolated the theoretical races CD and BCD from the field, nor have we been able to develop them in the laboratory.

In 1950 at State College, 6 weeks after blight had first appeared on such susceptible varieties as Katahdin and Russet Rural, it appeared and spread rapidly through an adjoining seedling plot of 6,000 plants, made up of families representing the various combinations of genes for blight resistance. From this plot, races A, B, C, D, BC, and BD were identified. About 400 selections from this plot were inoculated with the various races during the winter of 1950-51. In all instances, plants of the genotype CD or BCD were immune to all races. Comparison of field and greenhouse records revealed that in no case had a plant been recorded as blighting in the field, but immune in the greenhouse. Stated conversely, every plant recorded as blighting in the field was susceptible in the greenhouse to one or more of the known races. The evidence appears conclusive that the theoretical races CD and BCD did not develop in the field, under conditions so favorable that all other possible races did develop.

In 1951, blight appeared on a few susceptible varieties, but the season was so dry that the fungus shortly disappeared completely.

Using methods that have invariably yielded the other races, all attempts to develop races CD and BCD in the greenhouse have failed. To date, then, the virulence factors concerned in races C and D have not been combined in a single fungus nucleus (swarmspore), whereas virulence factors for races B and C, and B and D, have been so combined. These results are wholly unexpected, and in explanation of this phenomenon, we have suggested (Phytopath. 42: 28. 1942.) that factors for virulence in races C and D may be allelomorphic. Together with avirulence, as represented by race A, these factors represent a multiple allelomorphic series. Should this prove to be true

the two virulence factors found in races C and D could never be present in a single swarmspore, and plants carrying genes C and D would be permanently immune.

A complete set of differential varieties has been sent to Dr. R. W. Hougas, Leader, Potato Introduction Station, for increase in 1952. With these hosts, any interested breeders can identify races in his possession.

For the past 3 years, the majority of our crosses have been designed to bring together genes C and D. In 1952, about 50 selections of this nature as well as some 300 selections from the 1951 seedling plot, will be grown in replicated plots.

Regional Trials

Yields of 16 varieties, grown in 5 counties, are shown in Mills table 2.

Mills table 2. Yields of 16 varieties in five counties.

Variety	County and yields of U.S. #1											
	Lancaster		Lehigh		Potter		Somerset		Schuylkill		Average	
	total	US#1	total	US#1	total	US#1	total	US#1	total	US#1	total	US#1
	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.
Chenango	528	465	574	502	340	292	427	333	565	458	487	412
Cherokee	538	404	570	362	383	364	413	380	593	427	499	387
Essex	733	660	815	681	325	296	413	289	759	645	609	514
Katahdin	513	477	712	631	376	357	366	311	626	532	519	462
Kennebec	606	394	668	391	366	340	458	366	763	649	572	428
Madison	541	465	528	420	278	225	315	246	576	455	448	362
Pontiac	830	755	874	802	470	385	509	443	830	714	703	622
Russet Rural	539	480	691	486	454	413	432	415	650	488	553	456
White Rural	496	436	602	441	364	324	362	333	577	467	480	400
Snowdrift	450	356	495	362	301	235	392	310	524	335	432	320
Teton	592	515	800	690	406	376	453	412	715	636	593	526
2XJ-1	547	421	606	467	321	263	386	324	756	620	523	419
2YO-4	445	334	599	491	344	289	392	278	611	470	478	372
3DA-1	459	234	446	146	393	263	392	165	634	406	465	243
3DA-2	532	404	560	326	405	329	426	302	561	438	497	342
3 GR-8	602	470	567	440	347	236	331	278	689	620	507	409

Varieties were planted in 40-foot rows, replicated 4 times. Composite samples were taken from the 4 replications for specific gravity determinations. All specific gravity determinations were made by Professor J. S. Cobb, Department of Agronomy. The results are shown in Mills table 3.

Mills table 3. Starch content of 16 varieties grown in five counties.

Variety or seedling	Starch content and county in which grown				
	Lancaster	Lehigh	Potter	Somerset	Schuylkill
Essex	11.69	9.05	10.23	12.93	11.69
Chenango	12.44	12.44	10.23	13.91	14.41
2XJ-1	13.66	10.72	10.72	15.43	12.93
2YO-4	10.23	8.73	8.06	13.42	11.69
Russet Rural	14.66	11.94	12.93	20.33	14.66
Katahdin	13.42	10.96	10.72	14.92	14.17
3GR-8	14.92	11.20	13.42	17.72	14.92
3DA-2	13.42	11.68	13.66	16.44	13.66
Pontiac	11.94	8.97	9.99	13.91	12.67
Kennebec	14.17	9.76	12.67	15.92	15.92
Madison	14.92	14.17	10.96	13.66	14.92
Snowdrift	12.67	9.78	10.47	12.67	13.91
Cherokee	14.67	10.72	10.72	15.67	15.92
White Rural	15.43	10.72	10.96	16.18	16.18
3DA-1	13.91	9.78	10.72	13.42	11.94
Teton	12.18	9.78	8.06	13.66	14.17

Verticillium Wilt

Up to the present time, verticillium wilt has been of minor importance on potatoes in Pennsylvania. Every year a few tubers showing "pink eye" have been found. A selection called 2XJ-1 has been in regional trials for 4 years, where on the basis of U. S. #1 tubers, the average yield has exceeded all other varieties except Pontiac. It is susceptible to race D of Phytophthora infestans, but highly resistant to leaf roll. Its most serious fault appeared to be late maturity. Six acres were grown by a seedsman in Potter County in 1951 which was expected to furnish seed for release of the variety in 1952. On September 1, a large amount (10% to 12%) of wilt was observed in this field. Isolations from infected stems revealed verticillium. Katahdin and Kennebec in adjacent strips were too far gone to detect wilting, but none had been observed earlier. The season was ideal for wilt: a wet, cold June followed by severe drought in August and September. Whether 2XJ-1 is especially susceptible remains to be determined, but the variety will not be released this year.

RHODE ISLAND

C. R. Skogley

Twenty-five varieties and seedlings were tested in 1951 at Kingston for yield and quality. The data for these tests are given in R. I. table 1.

Rhode Island table 1. Yield and other data on 25 potato varieties grown at Kingston, R. I. - 1951

Variety	Yields U.S. No. 1 tubers per acre		Starch	Days to maturity	Tubers	
					Size	Shape
	Bu.	Pct.	Pct.	No.		
B606-67	848	99	12.73	136	Medium	Medium, irregular
Essex	786	97	9.68	126	Large	Smooth, irregular
Pontiac	784	97	10.04	133	Large	Rough, regular
Green Mountain	739	98	13.57	145	Medium	Medium, irregular
Ontario	731	95	11.04	146	Medium	Smooth, regular
B69-16	681	98	10.37	135	Large	Smooth, regular
Chippewa	669	96	9.46	133	Medium	Smooth, regular
Sequoia	649	97	10.62	152	Large	Medium, regular
B355-35	621	96	11.94	134	Small	Smooth, regular
Kennebec	617	97	10.13	133	Medium	Smooth, regular
Russet Rural	598	98	11.77	135	Medium	Smooth, regular
B446-8	589	97	8.43	132	Medium	Medium, regular
Teton	583	97	10.33	131	Medium	Smooth, regular
B76-43	568	98	11.67	115	Large	Rough, regular
Katahdin	566	97	10.55	134	Medium	Smooth, regular
Menominee	562	98	10.80	135	Medium	Medium, regular
Mohawk	518	99	13.20	138	Large	Smooth, regular
Warba	512	95	11.28	109	Medium	Medium, irregular
Irish Cobbler	510	92	12.08	105	Medium	Medium, irregular
Sebago	493	97	9.21	147	Large	Smooth, regular
X1276-185	489	92	11.00	126	Medium	Smooth, irregular
Earlaine	484	93	10.25	114	Small	Smooth, regular
B355-44	474	96	12.14	134	Medium	Medium, regular
Erie	469	95	10.45	136	Small	Smooth, regular
B447-98	448	94	11.73	109	Large	Medium, regular
	118 = LSD at 5%					

B606-67 was the highest-yielding selection but was not significantly higher in yield than Essex, Pontiac, Green Mountain and Ontario. The standard Green Mountain yielded significantly higher than 16 of the varieties in the test. The Kennebec variety, which was comparable to Green Mountain in 1950 in yield and quality, did not compare in either respect during 1951. Ontario, Essex, and Pontiac were the top-yielding varieties in 1950, and were high on the list for 1951.

In quality Green Mountain was again high, as scored by specific gravity readings. Mohawk was second in quality, followed by B606-67, B355-44, Irish Cobbler, B355-35, and Russet Rural. The overall specific gravity for 1951 was low, ranging from 1.078 for Green Mountain to 1.054 for B446-8.

Growth cracks occurred on tubers of the Green Mountain, B446-8, B76-43 and Katahdin varieties in varying amounts from 1 to 10 percent. A small amount of Rhizoctonia was present on all varieties, except Essex, B76-43, Warba, and Earlaine. A very small amount of scab was noted on the selection B606-67. Flea beetle damage was absent only on the varieties Pontiac, Russet Rural, Irish Cobbler, and Earlaine, whereas aphid injury was negligible on the Ontario, and B76-43 selections. All other varieties showed considerable aphid injury.

Diseases in general throughout the season were not serious. The spray program consisted of weekly sprayings using Parazate and DDT from June 20 to August 23. DDT was applied on June 7 as the first spray, and on August 2 nicotine sulfate replaced the DDT. On August 16, bordeaux was used instead of Parzate. Parzate alone was applied on August 30 and September 10.

The potatoes were planted on April 25 and dug on September 4, 5, 6, and 28. The 6 earliest varieties were dug early in September, and 19 varieties were dug on the 28th.

An 8-12-12 fertilizer at the rate of 1,800 pounds per acre was used. The test area had been in sod the previous 2 years. Yields were calculated from 32-foot rows, replicated 4 times.

The rainfall during the 1951 growing season as compared with normal is given below:

Inches of rain

	April	May	June	July	Aug.	Sept.
Normal	4.63	3.86	3.46	3.34	4.30	3.90
Actual	2.81	3.90	2.38	1.05	3.55	2.55

SOUTH CAROLINA

William M. Epps

The objective of the program is the development of a smooth, early, white-skinned potato, resistant to late blight and common scab, which will withstand shipment and will be suitable for chip making. All work is in cooperation with the United States Department of Agriculture.

The 1951 potato crop in South Carolina got off to a good start. The stand was good, and there were no late frosts to delay growth. The season during growth was unusually dry and, in spite of irrigation, the yields were relatively low. The early varieties, such as Cobbler and Bliss, suffered much worse from the drought than did the later varieties, such as Sebago and Kennebec.

There was no disease in any of the plantings other than a trace of several of the various virus diseases and black leg. Late blight did not appear.

Yields from the station variety trials are presented in S. C. table 1.

S. C. table 1. Yields of potato varieties at Clemson Truck Experiment Station, Charleston, South Carolina, 1951

Variety	Source of seed	Yield #1 size A's per acre	Maturity	Diseases 1/		
				LR	M	BL
		Bu.		Pct.	Pct.	Pct.
B 73-10	Maine	338	Mid-season		1.5	
Kennebec	Maine	332	Late			
Pontiac	North Dakota	324	Mid-season		1.5	
B 69-10	Maine	310	Late			0.5
B 73-10	North Carolina	293	Mid-season			1.5
Sebago	Prince Edward Island	291	Late			4.0
Cherokee	Maine	283	Mid-early		1.0	
Sebago	PEI (1 1/2 - 2 1/4 in.)	271	Late	0.5		
Kennebec	Tennessee	253	Late			
Cherokee	North Carolina	251	Mid-early	3.0		
B 76-23	Maine	250	Mid-season		.5	
B 73-3	Maine	240	Mid-late	.5	3.0	.5
Bliss	North Dakota	227	Early			
Cobbler	P. E. I.	210	Early			

L.S.D. 5%

1/ Diseases as percent estimated from counts of 200 plants. LR, leaf roll; M, mosaic; BL, black leg.

Tubers of several varieties were artifically skinned and exposed to the direct rays of the sun for varying periods in order to determine their susceptibility to exposure damage. Those varieties that have blackened quickly on exposure to the sun also have blackened in transit and have given trouble when shipped to northern markets. This characteristic caused the Katahdin to go out completely and has prevented the use of Kennebec in South Carolina. The degree of damage to the various varieties is shown in S. C. table 2.

S. C. table 2. Tuber defects noted in 7 potato varieties after exposure to direct sunlight for 60 and 90 minutes. (Temperature 85-88° F.; relative humidity 34%, wind 3 miles per hour; time 1:00 - 2:30 p.m.; clouds, none)

Variety	60 Minutes			90 Minutes		
	Sound	Browned	Scalded	Sound	Browned	Scalded
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
B 76-23	76	24	0	41	34	25
Cherokee	64	27	9	46	33	21
Sebago	34	58	8	23	50	27
B 73-3	29	55	16	27	36	37
B 73-10	23	55	22	31	26	43
Kennebec	13	58	29	10	45	45
B 69-16	21	35	44	16	19	65

It is believed that this test may be used as a screening test to determine the ability of the various seedlings and new varieties to withstand shipment.

B 76-23 produced a good yield of very attractive tubers, but a high percentage could not make the No. 1 grade because of "air cracks". This was the only one of the white-skinned potatoes that showed any significant degree of cracking.

B 73-10 contained a high percentage of pointed tubers, possibly caused by the very irregular moisture content of the soil during the season. If spindle tuber was present, it was not detected.

The seed of B 73-10, Cherokee, and Kennebec from Maine produced higher yields than seed of the same varieties produced in the south. The differences were not due to differences in stand or diseases.

Samples of Cherokee and B 73-10 were compared with similar samples of Sebago as to their suitability for chip making, since about half of the potatoes grown in South Carolina are used for this purpose. The chips from both varieties were satisfactory. Chips made from Cherokee were equal in color to those from Sebago. B 73-10 chips were slightly darker.

Tests over a period of years have indicated that Cherokee should be well adapted for use in South Carolina as a possible replacement for part of the Sebago acreage. It is resistant both to late blight and scab; it produces a high yield of smooth, white-skinned tubers; and it is mid-early. Tests in 1951 indicated that it should withstand shipment as well as Sebago and will make suitable chips. Samples were washed in a commercial washer in 1951. The general opinion of the various growers and buyers who saw it washed was that it should be satisfactory from the standpoint of appearance.

SOUTH DAKOTA

L. T. Richardson

The Cherokee has given the best all around performance this year for yield, scab resistance, and quality. Seedling B 515-2, which is scab-resistant, is not adapted to South Dakota conditions. It has low yields, is heavily russeted and tends to leave growth cracks. The starch content and cooking qualities were also low.

Selections for retesting include Pungo, B 402-1, B 961-20, B991-14, B 991-6, and B 962-9. These showed only slight amounts of surface scab, and none of the pitted or raised types.

VIRGINIA (Blacksburg)

F. S. Andrews

Thirteen lots of potatoes were obtained from Dr. Stevenson, United States Department of Agriculture, Plant Industry Station, and two lots that had been obtained from him and grown at Blacksburg, Va., in 1950, were included in the replicated plantings. The planting plan: Each variety was planted in 4 randomized replicated plots. Each plot consisted of 1 row, 25 hills, spaced 12 inches apart. The rows were 3 feet apart. The seed pieces were cut to approximately 1½ ounces.

The soil was prepared in the conventional manner, and 1,200 pounds of a 6-8-6 fertilizer was applied as follows: 500 pounds per acre was applied in single bands in the row and mixed with the soil before planting; 700 pounds was applied, broadcast, at the same time. Due to the late cold season, the potatoes were planted May 6. No fungicidal spray was used. The harvests were made when most of the vines were dead on the following dates: September 17: 76-43, Teton, B-355-44, B-73-10, X-96-56, B-606-67, Cayuga, B-404-1, Pawnee, and Mohawk. September 19 and 20: B-355-35, B-446-8, and B-447-98.

At harvest the potatoes were graded, and the weight of U.S. No. 1 and total weight were determined. The data for these tests are found in Virginia (Blacksburg) table 1.

Virginia (Blacksburg) table 1. Potato variety data, Blacksburg, Va., 1951

Variety name or number	U.S. No. 1 Yield per A.	Starch
	Bu.	Pct.
Cayuga	315	--
Mohawk	347	--
Pawnee	140	--
Red Warba	316	- -
Teton	520	10.7
B 69-16	306	11.9
B 73-10	196	13.1
B 76-43	346	- -
X 96-56	84	--
B 355-35	311	9.6
B355-44	452	--
B402-1	72	--
B 446-8	273	--
B 447-98	221	--
B 606-67	181	--
LSD 5% level	106.4	1.35

VIRGINIA (Norfolk)

M. M. Parker

Several of the named, newer varieties of potatoes obtained through the National Potato-Breeding Program for the 1951 plantings in eastern Virginia were used in an exploratory test to determine their resistance to seed-piece decay and hence their value to the grower of late-crop potatoes in Virginia. Other varieties and the seedling selections were used in an observational planting to screen out those having undesirable commercial characteristics.

Decay of the seed piece is usually of minor importance in our spring planting of potatoes but it has been and still is one of the major limiting factors in the successful production of potatoes planted in July for early November harvest. Most of these losses from decay apparently are due to the very high soil and air temperatures that usually prevail during the planting month of July. Sometimes these temperatures may be in the 90's and this, coupled with dry soils, may cause a loss of nearly 50 percent of the planted seed. Not infrequently, however, the cut seed pieces may decay in the short interval they are held between cutting and planting. For a new variety or seedling lot to be of value in eastern Virginia for planting the late crop,then, it should first possess resistance to decay even under the most unfavorable planting conditions.

Since the majority of the varieties and seedlings distributed by means of the breeding program are late in maturity, and therefore most suitable for late crop potatoes in Virginia, the tests reported here deal only with summer-planted stock, cut and planted under climatic conditions very favorable for seed-piece decay. Virginia table 1 gives the percent of seed pieces that decayed after being stored for 12 days in a cool basement in baskets covered with wet burlap. The treatment was intended to provide, as near as possible, suitable humidity and temperature conditions for the healing of the cut surfaces of the seed.

Va. table 1. The percent of seed pieces of five varieties that decayed after storing for 12 days in a cool basement in baskets covered with wet burlap.

Variety	Decayed seed pieces
	Pct.
Cobbler	0
Cherokee	4
Kennebec	12
Pontiac	98
Sebago	50

Another lot of these same varieties was cut and placed uncovered in a thin layer on a cool cement floor. The area was well ventilated. Counts of the decayed seed pieces were taken 6 days after cutting and the results are given in Virginia table 2.

Va. table 2. The percent of seed pieces of five varieties that decayed 6 days after storing in a thin layer on a cool cement floor.

Variety	Decayed seed pieces
	Pct.
Cobbler	0.8
Cherokee	34.0
Kennebec	5.0
Pontiac	42.0
Sebago	40.0

A third test consisted of cutting the seed of the five varieties, at the time of planting, and 1, 7, and 13 days, before planting. The cut seed was spread in a thin uncovered layer on a cement floor. The sound seed that remained was then planted in the field and records which are given in Virginia table 3 were obtained.

Va. table 3. Percentage stand and yields in 100-pound bags per acre of five varieties of potatoes planted with seed cut at four different dates and planted July 24.

Variety	Date seed cut and plant stand				Date seed cut and yield of primes per acre			
	July 11	July 17	July 23	July 24	July 11	July 17	July 23	July 24
	Pct.	Pct.	Pct.	Pct.	100 - lb. bags			
Cobbler	97	100	96	100	51	51	50	41
Kennebec	80	76	86	83	124	96	135	124
Pontiac	47	30	38	58	44	25	23	52
Cherokee	40	26	65	71	29	21	40	32
Sebago	33	30	38	78	20	24	44	71

The first two tests indicate that there is considerable difference between varieties in their ability to resist decay after the seed is cut. Of the five varieties tried Cobbler and Kennebec were most resistant. Cherokee, Pontiac, and Sebago were very susceptible. The third test showed that Cobbler and Kennebec could be cut well in advance of planting, if so desired, and satisfactory stands of plants would result. But Cherokee, Pontiac, and Sebago were very susceptible to decay when cut and held for any length of time before planting. Much of the loss could be avoided, however, by cutting the seed and planting immediately afterwards. This is well illustrated by the Cherokee, Pontiac, and Sebago varieties, which gave nearly double the stand of plants from seed cut and planted immediately compared with seed cut and held a week before planting.

In those varieties and seedling lots used for observational purposes the Pungo gave better yields than the White Rose, Calrose, Essex, Potomac, and Cayuga. It did not yield as well as 355-35 or 73-18. Lots number 73-10, 96-44, 1276-185, 447-98, 46952, and 927-3 gave very poor yields.

Although lot 73-18 gave slightly better yields than lot 355-35 we considered 355-35 to be the more desirable. This was because 73-18 developed internal stress cracks at the time of harvesting and upon being dug splits about 1 inch long by 1/4 inch deep developed in a large number of the tubers. This same condition was even apparent in the seed stock before it was planted.

WASHINGTON

S. B. Locke

Potato leaf roll resistance trials were carried out in 1951 as in the preceding years in cooperation with Dr. C. L. Vincent. Twenty-six varieties were exposed to natural infection by the leaf roll virus during 1950, and samples from these plots were indexed in the greenhouse the following winter. The data obtained appear in Locke table 1. They indicate that:

Leaf roll spread in the plots was less in 1950 than in 1949, but in the same relative order with respect to locations; i. e., Mt. Vernon, Wash., 15.7%; Prosser, Wash. 28.3%; and Pullman, Wash.; 21.9%.

Of the 27 varieties and seedlings tested, only 1, B 579-3, showed no leaf roll increase at all. Katahdin showed an average increase in leaf roll infection of 4.1%; Essex 8.6%; and X1276-185--10.7%. The latter seedling has shown very little leaf roll infection during the past 2 seasons. The higher average value for 1950 is due to a large increase (27.5%) at Pullman, the increase being low at Prosser and Mt. Vernon. Among the varieties included for the first time during 1950, the following show promise of possessing some field resistance to leaf roll infection: B 754-16, B 505-44, Progress, Selection A, Waseca, Yampa, and Satapa. However, further testing is needed in order to determine their response.

Netted Gem showed an average increase in leaf roll infection of 31.5%. Of the varieties new to the test during 1950, Columbia Russet, LaSalle, and Canus appear to be quite susceptible to field infection with leaf roll.

Locke table 1. Percentage increase of leaf roll infection of Potato varieties in the field during 1950.

Variety	Increase of leafroll content				
	Northwestern Washington (Mt. Vernon)	Central Washington (Prosser)	Eastern Washington (Pullman)	Ave. of 3 locations	Maximum
	Pct.	Pct.	Pct.	Pct.	Pct.
Canoga	28.5	0.0	19.1	15.9	28.5
Canus	44.1	87.9 1/	77.1	69.7	87.9
Chenango	22.6	1.4	54.3	26.1	54.3
Columbia Russet	1.3	57.7	23.8	27.6	57.7
Dakota Chief	6.4	10.8 1/	8.0	8.4	10.8
Essex	3.5	14.2	8.1	8.6	14.2
Katahdin	1.6	1.1	9.7	4.1	9.7
Kennebec	19.9	36.1	32.6	29.5	36.1
LaSalle	40.3	23.7	23.6 1/	32.2	40.3
LaSoda	8.4	14.1	11.5 1/	11.3	14.1
Menominee	7.6	69.7	30.5	35.9	69.7
Mohawk	26.3	83.2	40.4	37.5	83.2
Netted Gem	29.2	24.6	40.7	31.5	40.7
Ontario	10.4	57.9	15.2	27.8	57.9
Progress	.9	4.1	1.9	2.3	4.1
Russet Sebago	11.8	20.4	9.5	13.9	20.4
Satapa	41.7	.0	12.8	18.2	41.7
Sebago	13.1	57.1	10.2	26.8	57.1
Selection A 2/	.0	8.4	.0	2.8	8.4
Teton	14.8	82.2	63.9	53.6	82.2
Weseca	11.8	.0	9.0	6.9	11.8
White Pontiac	20.2	36.4	42.8	33.1	42.8
Yampa	5.5	17.1	10.1	10.9	17.1
X1276-185	.7	3.8	27.5	10.7	27.5
B 505-44 3/	6.3	.0	.5	2.3	6.3
B 579-3 3/	.0	.0	.0	.0	.0
B 754-16 3/	.0	6.3	.0	2.1	6.3
Average	15.7	28.3	21.9	20.9	

1/ Missing plots; data supplied by interpolation and used in obtaining average values.

2/ Seedling selected by Dr. Martin Carstens at Mt. Vernon, Wash., from U.S.D.A. seedlings grown by him.

3/ Seedling supplied by Dr. J. D. Menzies, Prosser, Wash.

WASHINGTON

J. D. Menzies

Field-Exposure Tests of Seedlings for Resistance to Leaf Roll.

This year 32 seedlings, saved from previous years' tests, were retested for field resistance to leaf roll, using 50-foot rows. One hundred seventy-five seedlings were tested for the first time, in 5-hill units; and 685 seedlings were tested as single-hill units. All seedlings have originated through Beltsville or from Dr. John McLean, Aberdeen, Idaho.

One group of 29 seedlings had been tested for leaf roll since 1948. This was their fourth year in the field-exposure plots. Since these had already demonstrated some field resistance attention was paid to tuber type and other characters besides leaf roll. Sixteen were discarded because of chronic leaf-roll, 1 was discarded for close to 100 percent mosaic, and 3 for heavy current-season leaf roll. Of the 9 survivors only 1 showed any leaf roll. This one had 5 percent chronic leaf roll but was saved because of good tuber type. Because of the severity of the field-exposure test, 8 of these 9 seedlings should be considered field-resistant to leaf roll. The parentage and tuber type of these seedlings are shown in Washington table 1. One or two may be

Washington table 1. Seedlings surviving fourth year of field exposure to leaf roll.

Washington No.	Cross No.	Parentage	Remarks
WP. 5	B 1203	X 247-48 Selfed	Oblong white, low yield
*21	B 2288	Placid x B 522-33	Smooth, oblong, slight russet, good appearance.
22	B 2041	X 750-10 x X 247-48	Small, oblong, good yield
31	B 1031	X 1276-185 x X 96-56	Rough tubers, low yield
49	B 2041	X 750-10 x X 247-48	Oblong, white, good yield
57	B 2291	Virgil x B 522-33	Oblong, slight russet, good yield.
77	B 2299	B 522-33 x X 792-94	Round, white, deep eyes
92	B 2038	Shamrock x 1241-91	Small, rough, round tubers
94	B 2291	Virgil x B 522-33	Tubers small, good yield

* 2 units of chronic leaf roll.

worth testing for commercial use but their main value is probably as breeding material.

Three other seedlings, B 729-1, S 6316, and B 778-28, were tested for the second year. All developed some leaf roll. B 729-1 was saved for further testing because of low leaf roll incidence and good tuber type.

Seedling B 579-3 has been in the leaf roll tests for 5 years and has never been rogued. This year 1/8 acre was planted for increase. Most of the plants developed a basal rolling of the leaves in mid-season that looked like chronic leaf roll. No leaf roll symptoms have been found on terminal growth during the 5 years. It will be necessary to index this seedling onto another variety before it can be decided whether it is free from leaf roll or only a tolerant carrier. Horticulturally, it is a very nice potato - smooth, white, and oblong-oval in shape. On the other hand, it is susceptible to late blight and scab.

Of the 685 single-hill seedlings all but 51 were discarded because of leaf roll, other viruses, or undesirable horticultural characters. This was the second attempt to increase seedlings at Prosser from the 1-hill stage. There has been such a large loss from viruses such as calico, mosaic, purple-top, and green-dwarf that this practice will be discontinued and only clone samples used.

The fate of the 175 lots tested as 5-hill units is shown in Washington table 2.

Washington table 2. Leaf roll incidence and other reasons for discards among 175 potato seedlings exposed in 5-hill lots.

Total seedlings tested	175
Current-season leaf roll infected	88
Total seedlings discarded	143
Reason:	
Leaf roll	84
Tubers too rough	44
Tubers too small	2
No tubers formed	3

Of this group only 30 were saved, although 87 were free of current-season leaf roll symptoms. The elimination of one-third of the seedlings because of poor horticultural characters seems justified now that some progress has been made in locating sources of leaf roll resistance for further breeding.

This group of seedlings provides further evidence that the use of parents at least partially field-resistant to leaf roll is increasing the chance of getting resistant seedlings. There were 22 crosses included in this group, all bred by Dr. Stevenson from field-resistant parents, except two crosses with Russet Burbank received from John McLean at Aberdeen, Idaho. The latter crosses were represented by 40 seedlings, 38 of which were eliminated by current-season leaf roll. There were, on the other hand, 85 leaf-roll-free clones from the 135 seedlings representing the resistant group. Expressed percentagewise the susceptible crosses gave 5 percent survival the first year compared with 63 percent among the resistant crosses. This does not mean that 63 percent of these seedlings are field-resistant to leaf roll because 1 year's test is not very severe. It emphasizes, however, the extreme susceptibility of the Russet Burbank crosses. An additional group of 82 seedlings, represented by single tubers, out of the same two crosses with Russet Burbank, were grown as tuber units of from 1 to 4 hills each. All but 4 of these were definitely infected with current-season leaf roll before the end of the season.

Observations on Tuber Type in Various Crosses.

The potato industry of the Northwest is built around the Russet Burbank variety. This long russet potato unfortunately is very susceptible to leaf roll and net necrosis. There is, therefore, a natural desire to know what the possibilities are of building up long or long-russet types in the breeding program.

Some evidence on this point is offered by the group of 685 single-hill seedlings referred to above. These were bred for russet skin and/or long tubers and not with leaf roll resistance in mind. The tuber types obtained from these crosses are summarized in Washington table 3. It is clear that both

Washington table 3. Tuber shapes and skin types in seedlings grown from six crosses with russet-skin parentage.

Cross No.	Parentage	Total seedlings	Long 1/ white	Long 2/ russet	Round white	Round russet
		No.	Pct.	Pct.	Pct.	Pct.
A101	Russet Burbank x Menominee	40	12.5	47.5	17.5	22.5
A102	Russet Burbank x Earlaine	80	32.5	21.5	25.0	21.5
B2762	B 247-48 x B 157-9	183	1.6	.0	79.2	19.1
B2700	B 859-14 x B 157-9	146	1.4	.7	84.9	13.0
B2761	B 157-9 x B 759-64	101	3.0	.0	67.3	29.7
B2766	B 582-33 x B 157-9	175	.6	.0	81.1	18.3

1/ Long = more than twice as long as wide.

2/ Russet includes netted types.

long types and russet types can readily be obtained out of Russet Burbank. The russet parent, B 157-9, produces a good percentage of russets but few long tubers in its progeny. While these two Russet Burbank crosses produce progeny almost 100 percent susceptible to leaf roll there was no leaf roll resistance represented in the other parent. These data show that it might be practical to work the long russet characters into the leaf roll resistance program. Russet Burbank is a difficult parent to use in a breeding program but John McLean at Aberdeen is using it successfully.

WASHINGTON (Pullman)

C. L. Vincent

Potato-breeding and variety studies were continued in the State of Washington in 1951 as in 1950. (See the National Potato-Breeding Program 1950, page 207 for plot set-up).

The computed per-acre yields of all varieties were low in the Mt. Vernon plantings as the season was very dry. At this place no irrigation is practiced and no rain fell from the time the potatoes were planted until after they were dug, a very unusual condition for the Puget Sound area of Washington.

A similar planting at Pullman did exceptionally well as two or three good summer rains occurred to keep the plants growing vigorously until time to harvest.

The plantings in three locations were of the same plot design, each variety being in close proximity to a row of potatoes known to be infected with leaf roll. Leaf roll resistance is of particular interest in these studies. The three plantings were made within the same week, namely, May 11 to May 18.

The variety Ashworth, as listed in Vincent table 1, is indicated as being resistant to leaf roll. A small sample of tubers showing leaf roll resistance under his conditions had been sent to me by Fred L. Ashworth of Heuvelton, New York. However, in each of the three Washington plantings Ashworth was found to be badly infected with the disease.

Vincient table 1 shows the yield data at each of the three locations. The "C.S." seedlings were obtained from the U.S.-Colo. Potato Field Station at Greeley, Colo., B-579-3 was a promising leaf-roll resistant seedling furnished by J. D. Menzies, U.S.D.A. cooperator at Prosser, Wash. Selection A appeared to be a promising leaf-roll and late-blight-resistant seedling selected at Mt. Vernon from some U.S.D.A. seedlings that had been grown in test plots there for several years, and 45.11-8 and 45.12-3 were special seedling selections furnished by Ben Picha of Grand Forks, N. Dak.

Vincent table 2 gives the specific gravity readings of the potatoes grown at each of the three Washington locations. Specific gravity was determined by using the formula specific gravity equals the weight of potatoes in air divided by the weight of potatoes in air minus the weight of potatoes in water. Upwards to 4 kilograms of sound tubers that had been selected at random from each variety at each of the three locations were used in making these determinations.

Vincent table 3 shows some tests with scab-resistant seedlings furnished by the U.S.D.A. Station at Greeley, Colo. They were grown at Pullman on a Palouse silt loam soil, without irrigation.

Vincent table 1. Yield test of potato varieties. Average of four replications at each location, 1951.

Variety or seedling	Place grown in Washington						Av. total yield per acre for the three places	Av. yield No. 1 tubers per acre for the three places
	Prosser		Mt. Vernon		Pullman			
	Total yield per A	Yield No. 1 tubers per A	Total yield per A	Yield No. 1 tubers per A	Total yield per A	Yield No. 1 tubers per A		
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Ashworth (res.)	12.88	12.09	6.55	5.84	7.71	7.22	9.05	8.38
B-579-3	21.29	20.71	7.19	5.72	9.29	8.44	12.59	11.62
Canus	27.13	25.79	6.30	4.55	16.15	13.65	16.53	14.66
Cherokee	23.32	21.56	7.24	5.95	13.58	12.34	14.71	13.28
Columbia Russet	22.79	21.58	8.87	6.82	11.52	10.35	14.39	12.92
C.S. 6316	15.28	14.46	4.52	3.36	9.80	9.11	9.97	8.98
C.S. 8827	24.41	20.34	4.37	2.88	12.98	11.14	13.92	11.45
C.S. 9354	19.63	17.73	5.58	4.00	12.87	11.50	12.69	11.08
Red Pontiac	29.24	26.77	10.81	9.07	11.27	10.09	17.11	15.31
Essex	29.91	28.00	10.02	8.88	11.85	10.69	17.26	15.86
Katahdin	25.91	25.10	5.95	5.44	11.54	11.13	14.47	13.89
Kennebec	30.31	28.98	9.14	8.35	14.01	13.34	17.82	16.89
Russet Burbank	20.67	16.73	5.57	2.17	9.07	6.11	11.77	8.34
Ontario	21.20	16.62	9.58	8.06	10.46	8.64	13.75	11.11
Progress	26.64	23.63	7.55	3.99	14.39	11.54	16.19	13.05
Russet Sebago	22.98	21.69	8.06	7.19	11.15	10.29	14.06	13.06
Satapa	26.26	25.41	9.92	4.79	23.22	21.45	19.80	17.22
Selection A	15.75	13.41	6.79	5.93	6.35	5.68	9.63	8.34
Waseca	21.14	20.34	5.77	4.74	19.93	18.42	15.61	14.50
White Pontiac	25.93	23.60	6.30	5.57	16.13	14.88	16.12	14.68
Yampa	21.56	18.55	7.30	5.88	12.97	11.40	13.94	11.94
X-1276-185	22.30	21.55	7.11	5.74	11.63	10.34	13.68	12.54
45.11 - 8	22.47	20.82	6.99	4.46	13.14	11.12	14.20	12.13
45.12 - 3	20.87	19.63	7.46	3.12	13.45	11.29	13.93	11.35

Vincent table 2. Specific gravity of some potato varieties grown in three sections of Washington in 1951.

Variety	Specific gravity			Mean starch content three locations
	Pullman	Prosser	Mt. Vernon	
				Pct.
Ashworth	1.0840	1.0570	1.0746	12.2
B 579-3	1.0984	1.0900	1.1007	17.4
Canus	1.0793	1.0663	1.0726	12.4
Cherokee	1.1042	1.0688	1.0853	15.2
Columbia Russet	1.0942	1.0701	1.0947	15.3
CS 6316	1.0844	1.0684	1.0851	13.7
CS 8827	1.0817	1.0617	1.0708	12.0
CS 9354	1.0748	1.0652	1.0769	12.3
Dakota Chief	1.0835	1.0637	1.0812	13.0
Essex	1.0765	1.0659	1.0763	12.4
Katahdin	1.0879	1.0757	1.0896	14.9
Kennebec	1.0989	1.0786	1.0918	16.0
Russet Burbank	1.0852	1.0698	1.0866	14.0
Ontario	1.0911	1.0745	1.0850	14.7
Progress	1.0869	1.0787	1.0859	14.8
Russet Sebago	1.0799	1.0635	1.0872	13.2
Satapa	1.0800	1.0746	1.0921	14.4
Selection A	1.0802	1.0782	1.0944	14.8
Waseca	1.0848	1.0672	1.0807	13.4
White Pontiac	1.0811	1.0693	1.0723	12.7
Yampa	1.0884	1.0757	1.0964	15.4
X-1276-185	1.0866	1.0762	1.0839	14.4
45.11-8	1.0800	1.0693	1.0777	13.0
45.12-3	1.0773	1.0612	1.0771	12.2

Vincent table 3. Potato trials on scab resistance, Colorado seedlings, 1951.

Variety	Hills harvested	Total weight	Weight #1 tubers	Computed yield per acre		Scab Infection Index			Color tuber
				Total	No. 1	Low	Medium	High	
	No.	Lb.	Lb.	Tons	Tons				
CS 5244	18	20	18	8.06	7.26	X			White
CS 6362	20	14	11	5.08	3.94		X		White
CS 9887	19	40	37	15.25	14.16	X			Red
CS 9947	19	13	10	4.94	3.85	X			White
CS 10060	20	8	7	2.90	2.54	X			White
CS 10087	18	13	10	5.23	3.94			X	Russet
CS 10110	18	13	10	5.23	3.94			X	White
CS 10135	19	24	19	9.15	7.26	X			Skin rough (russet)
CS 10204	19	34	20	13.00	5.62	X			White
CS 10205	20	22	17	7.99	6.17	X			White
CS 10206	20	30	22	10.89	7.99	X			White
CS 10212	15	25	20	12.56	9.66	X			White
CS 10213	15	26	25	12.56	12.12	X			White
CS 10218	20	26	15	9.44	5.44	X			White
CS 10220	20	28	18	10.16	6.53	X			White
CS 10236	20	33	19	11.98	6.90			X	White
CS 10267	20	27	16	9.80	5.81	X			Red
CS 10271	14	22	14	11.40	7.26	X			Rough white skin
CS 10287	20	32	26	11.62	9.44	X			Red

WEST VIRGINIA

K. C. Westover

The testing and selection work done by the Department of Horticulture during the past season was carried on at the Reedsville Experiment Farm at Reedsville, W. Va. (alt. 1,800 feet). Weather conditions as a whole were not particularly favorable for the crop, the early part of the growing season being warm and dry and the mid and late summer cool and so wet as to prevent as frequent spraying as intended. Despite this, careful inspection failed to reveal infestation of late blight. The plantings were on a well-drained, medium sandy-loam soil in good tilth. A 1,600-pound application of a 5-10-10 commercial fertilizer mixture was applied bandwise at planting time. The spacing between rows was 3 feet, and unless otherwise stated the sets were 10 inches apart in the row. The plants were killed with a chemical killer on September 20 and harvest began about 2 weeks later. Specific gravity determinations were made immediately at harvest.

Family-line Planting

Twenty-six family lines, seven from Beltsville and nineteen from Iowa, totaling some 3,000 tubers were planted in hills 40 inches apart. With the exception of 2 from Beltsville, all were bred (and those from Iowa screened) for late blight resistance and in most cases resistant to scab, hopperburn, leaf roll and the virus A and X, either singly or in combination. An attempt to screen plants from populations B 3095 (Houma x Triumf) and B 3096 (Houma x B 572-92) for late-blight resistance failed. However, these plants, although set in the field too late to mature normally, were included in the inspection at harvest. Of these, 105 selections based on plant vigor, yield, and tuber type have been retained for further observation.

In addition to these family lines, 70 single-tuber lots from first-year selections and 27 lots from second-year selections made at Iowa were grown. Of the first group 14 and of the second 4 have been retained for trial next season.

10-Hill Unit Planting

The 10-hill unit planting consisted of 141 units. The hills in the units were 20 inches apart in the row and the units were separated by a space of 50 inches. Check units of certified Cobblers and Sebagos occurred alternately every third unit in the row and were "staggered" across the planting so that each seedling stock was flanked by one check variety and not more than one row removed from the other. All of the seedstocks in this planting carried resistance for late blight and the majority for scab as well. Selections were based on plant and tuber type and yields. Specific gravity determinations from two 10-tuber samples from each unit were recorded. For next season's 50-foot trials (see W. Va. table 1), 21 selections have been held.

W. Va. table 1. Yields and starch readings from 1951 replicated potato variety trials, Reedsville Experiment Farm, W. Va.

Variety	Source	Yield per acre		Off-grade	Starch
		No. 1's	Off-grade		
		Bu.	Bu.	Pct.	Pct.
B 2070-14 (WVa)[1]	Tuber Indexed[2]	473.6	59.3	11.1	12.8
Essex	" "	469.1	27.2	5.5	11.9
B 2070-30 (WVa)[1]	" "	446.3	83.9	15.8	14.0
Menominee	" "	434.6	49.0	10.1	12.9
B 2070-10 (WVa)[1]	" "	410.5	41.8	9.3	14.5
Sebago	" "	406.2	59.8	12.8	13.8
Ashworth	" "	399.7	40.1	9.3	14.2
Pontiac	" "	389.6	48.0	11.0	13.0
Kennebec	" "	374.8	68.4	15.4	14.1
Houma	" "	371.5	69.1	15.7	15.0
Ontario	" "	369.1	49.5	11.8	13.6
Pungo	" "	365.3	49.5	11.9	13.1
Cherokee	" "	347.2	71.6	17.1	13.6
Cobbler	Canadian Cert.	344.7	52.4	13.2	14.5
Sebago	" "	333.9	52.3	13.6	12.2
M105.44-7	Tuber Indexed	333.2	47.1	12.4	14.1
Chippewa	" "	323.1	69.2	17.7	12.3
BN-5 (Pa)	" "	310.1	64.2	17.2	12.3
Katahdin	" "	299.2	46.3	13.4	13.1
ND148-84	" "	293.6	72.7	19.8	13.5
DVAO	" "	288.5	35.6	11.0	12.9
Chenango	" "	283.7	87.6	23.6	13.2
Cobbler	" "	272.0	77.1	22.1	13.6
BP-7 (Pa)	" "	250.0	83.6	25.1	13.6
Snowdrift	" "	235.3	64.2	21.4	10.8
	L.S.D. 5%	77.9			
	" 1%	103.9			

2/ Carried over and tuber indexed.

1/ Parentage Chippewa x B 594-46 resistant to blight and scab.

Fifty-foot Row Planting

This season's 50-foot row planting included a single 50-foot row of each of 86 seedling stocks, nearly all of which originated at Beltsville. Check rows of certified Cobbler and Sebago occurred alternately every third row so that each seedling was flanked on one side by one of the check varieties and was not more than a row removed from the other. Of these seedling stocks 20 are being held for further trial. W. Va. table 2 lists these selections, together with their yields and parentage.

Replicated Planting

The replicated trials contained 4 replications in 50-foot, single-row plots of each of 25 varieties in an incomplete block (lattice) arrangement. With the exception of a sample each of certified Cobbler and Sebago, which were included to serve as a possible measure of "place effect", all of these seed lots had been grown here a year or longer and had been tuber-indexed before they were planted. The 15 named varieties in the planting included those known to be well adapted here, as well as several others only recently named. All of the 8 seedling stocks in the planting have been grown here for several years. Three selections, medium to late in maturity, from a Beltsville cross, carrying resistance for late blight and scab, seem to be particularly well-adapted to the intermediate altitudes. B 2070-10 W. Va. is blocky, round-flattened in shape, smooth with few and shallow eyes, and slightly russeted skin buff in color. B 2070-14 W. Va. is medium-long, round-flattened, and smooth, with few but distinct eyes, and the skin is white. B 2070-30 W. Va. is short and round, slightly flattened and smooth, with distinct but shallow eyes except for the bud cluster which is deeper. The skin is white. W. Va. table 3 summarizes the yield data from this planting. The same 5 named varieties in nearly the same order that yielded highest in 1950 again yielded highest this season. In the near future, all named and seedling stocks retained for next season will be tuber-indexed. The latter will also be screened for late blight.

W. Va. table 2. Selections from 50-foot row plantings, Reedsville Experiment Farm, 1951.

Variety	Parentage	Yield per acre		Off-grade	Starch	Resistance
		No. 1's	Off-grade			
		Bu.	Bu.	Pct.	Pct.	
X494-1	Earlaine x R. Jubel	406.2	30.6	7.0	13.7	L.B.
B 607-56	B 83-9 x Teton	389.9	30.6	7.3	16.1	L.B., R. Rot
B 2067-25	Chippewa x B 381-2	366.8	77.3	17.0	14.0	Scab
B 2067-96	Chippewa x B 381-2	383.7	29.5	7.1	11.5	"
B 2069-74	Chip x (X528-170)	418.4	48.7	10.4	12.8	"
B 2147-14 WVa	B 245-186 x B 522-33	491.4	50.3	9.3	13.4	Scab,L. Roll
B 2346-3 "	528-170 x B 76-53	381.1	28.2	6.9	14.1	L.B., Scab
B 2346-20 "	528-170 x B 76-53	375.2	20.1	5.1	14.9	" "
B 2346-34 "	" "	382.4	27.6	6.7	14.1	" "
B 2347-2	" x 157-9	326.9	51.4	13.6	12.3	" "
B 2390-6	B606-37 x B 607-56	472.1	36.5	7.2	12.5	"
B 2395-9	B 607-72 x B 606-3	360.0	16.3	4.3	13.5	"
B 2399-10	Kennebec x B 445-41	342.0	83.2	19.6	13.1	"
B 2427-8 WVa	Chippewa x Katahdin	430.2	49.1	10.3	12.7	Viruses A & Y
B 2427-33 "	" "	411.6	21.9	5.1	12.1	" " "
B 2427-39 "	" "	498.7	31.7	6.0	11.4	" " "
B 2427-41 "	" "	549.7	30.1	5.2	10.0	" " "
B 2488-59	Chippewa x Cherokee	463.2	67.1	12.7	13.9	L.B., Scab
B 2431-64	Chippewa x B 445-41	443.3	49.2	10.0	13.7	L.B.
B 2433-7 WVa	157-9 x B 778-14	432.3	28.3	6.2	12.1	L.B., Virus A
Cobbler Cert.	(ave 23 checks)	350.4	40.1	10.4		
Sebago Cert.	(ave 24 checks)	332.9	49.1	12.9		

W. Va. table 3. Selection from 10-hill unit planting, Reedsville Experiment Farm, 1951.

Variety	Parentage	Yield per acre		Off-Grade	Starch	Resistance
		No. 1's	Off- Grade			
		Bu.	Bu.	Pct.	Pct.	
I906-4 WVa	B595-76 x B 67-11	503.8	50.8	9.2	16.8	Scab L.B. X
913-4 "	B 76-23 x B 67-11	351.4	14.5	4.0	13.1	Scab L.B.
922-9 "	B 773-27 x N117.43-3	441.4	65.3	12.9	12.2	L.B. scab
933-3 "	B 607-72 x M113.43	332.5	55.2	14.2	13.7	Scab L.B.
933-4 "	" "	437.0	49.4	10.2	12.5	Scab L.B.
933-10 "	" "	354.3	26.1	6.9	13.7	" "
956-2 "	7137 x B 61-3	683.9	31.9	4.5	13.0	" "
956-5 "	" "	342.7	21.8	6.0	11.4	" "
956-6 "	" "	368.8	13.5	3.5	13.2	" "
957-5 "	7137 x B 61-11	422.5	50.8	10.7	13.3	" "
970-4 "	N43.41-1 x B 874-25	229.4	21.8	8.7	15.7	L.B. scab
971-1 "	X 26.8 x B 67-11	315.1	47.9	13.2	15.8	L.B. scab
971-8 "	" "	261.4	26.1	9.1	14.9	L.B. scab
977-1	I712-1 x B 67-11	394.9	30.5	5.8	14.5	L.B. scab
225-A-1		410.9	30.5	6.9	11.5	
B2346-24 WVa	B 528-170 x B 76-23	373.2	27.6	6.9	14.0	L.B. scab
B2346-37 "	" "	483.5	8.7	1.8	14.1	L.B. scab
B2858-5 "	B 381-2 x Katahdin	275.9	26.1	8.7	14.3	Virus A scab
B2862-1 "	B 381-2 x B 594-46	379.0	40.7	9.7	16.8	Scab L.B.
I2902-1 "	B 76-23 x B 605-10	500.9	17.4	3.4	13.2	
B2923-3 "	B 608-56 x B 580-20	397.8	29.0	6.8	12.3	Scab L.B. R.rot
Cobbler Cert.	(av. 37 checks)	283.3	28.0	9.0		
Sebago Cert.	(ave. 37 checks)	326.4	37.9	10.4		

WISCONSIN
D. C. Cooper, G. H. Rieman, and R. W. Hougas

Mycorrhiza-Like Mycelium in Potato Tubers

A mycorrhiza-like mycelium has been found to be regularly associated with the phloem parenchyma of the potato tuber. Tubers from 30 varieties and strains of potato obtained from 7 different locations in Wisconsin and from 10 potato-producing States, as well as from 150 seedlings grown at Madison, Wis., have thus far been examined (Cooper table 1). A mycorrhizal-like fungus was found to be present in all tubers. Similarly, such a fungus was present in the tubers of 7 additional species of tuber-bearing Solanums, namely, S. andigenum, S. demissum, S. gibberulosum, S. lanciforme, S. pinnatisectum, S. semidemissum, and S. verrucosum.

A study of the development of the potato tuber revelead that strain(s) of fungi come in contact with the growing tip of the rhizome, penetrate its apex, and become associated with the vascular tissue. Shortly thereafter elongation slows down, and the apical portion of the rhizome enlarges to form a tuber. When tuberization fails to occur the rhizome forms a leafy shoot. Examination of such shoots has failed to reveal the presence of a fungus.

Earlier investigators (de Vries, Reed, Clark, and Artschwager), who studied the ontogeny and anatomy of the potato tuber, failed to note the occurrence of such a relationship in either the young or more mature organs. Even Magrou, who made an extensive study of the symbiotic relationship that exists between a fungus and the secondary roots of the potato plant, was not aware of such an association in the tuber. He found that plants grown from true seed were often weak and poorly developed. The rhizomes shortly became leafy shoots. He could detect no evidence of an endotrophic mycorrhiza in the secondary roots of such plants. He decided that the fungus secretes enzymes that transform the stored starch into soluble sugars, thus raising the molecular concentration within the plant, and that when a certain level is reached the tips of the rhizomes are stimulated to form tubers.

Preliminary tests have been made to determine whether the presence of the fungus within the rhizome stimulates the formation of the tuber. Plants from true seed were grown on a sterile substrate. Numerous rhizomes were produced which in turn formed secondary stems. Tubers were not produced. Such findings are in line with those of Magrou. The fungus upon entering the tip of the rhizome apparently produces some substance that stops rapid elongation and in turn tuberization is initiated.

Cooper table 1. Varieties and seedlings examined.

Variety	Source Wis.	Variety	Source Wis.	Source Other States
Chippewa	3 1/	Wis. K 5	1	
Essex	1	Wis. M 304	1	
Hindenberg	2	Wis. M 330	1	
Irish Cobbler	1	Wis. M 439	1	
Kennebec	1	Wis. 804	1	
Lake	1	150 seedlings	1	
Ontario	3	Katahdin	1	Maine
Pontiac	2	Red Pontiac	1	Florida North Dakota
Progress	1	Russet Burbank	4	Idaho
Red Warba	1	Red McClure		Colorado
Russet Rural	2	White Rose		California
Russet Sebago	1	Iowa 6316		Iowa
Sebago	1	Mich. 46-1		Michigan
Triumph	1	Minn. 147.44-17-46		Minnesota
Wis. 303-4	1	Nebr. 4		Nebraska
Wis. 303-40	1			

1/ Number of locations in Wisconsin.

WISCONSIN

G. H. Rieman and G. W. Stokes

Potato Variety and Advanced Generation Selection trials in Wisconsin During 1951.

A recent survey made by the Wisconsin Department of Agriculture and Markets shows that 14 varieties of potatoes are grown commercially in the State. Chippewa is the leading variety and accounts for over one-third of the total acerage. Katahdin is the next most important variety accounting for 12 percent and Sebago ranks third with 10 percent in acreage grown. The once popular varieties Irish Cobbler and Russet Rural are gradually being decreased and now represent only 8 percent and 5 percent, respectively, of the total acreage. The following four varieties have increased in popularity during the past decade.

	1940	1950
		Pct.
Russet Sebago	0	6
Pontiac and Red Pontiac	0	7
Russet Burbank	0	6
Ontario	0	1
		20

The Kennebec variety will probably increase in popularity as soon as sufficient seed for commercial plantings becomes available.

A study was made to determine the yielding ability and cooking quality of 16 varieties and 7 advanced-generation selections. The specific gravity determinations listed in Rieman table 1 agree with other studies and emphasize the fact that this important attribute is influenced by both the season and variety. Approximately half of the 23 varieties under test produced potatoes suitable for baking during the 1950 season, whereas not a single variety produced potatoes of baking quality (specific gravity above 1.08 and actual baking tests) in 1951. A more critical inspection of the results shows that the various varieties tend to maintain their relative positions in respect to starch content under varying conditions of growth. Three varieties, Russet Burbank, Russet Rural and Kennebec, and 5 scab-resistant advanced-generation selections ranked high in specific gravity during both a favorable and an unfavorable growing season. From the standpoint of culinary quality the new scab-resistant selections M439, M330, 303-4, M304, and M804 show real promise, but they are not among the highest yielding varieties.

Rieman table 1. Yield and specific gravity determinations for 23 potato varieties and advanced selections grown on the Powel Farms at Antigo, Wis., during 1950 and 1951.

Variety	Season	Yield per acre U.S. No. 1 1/		Specific gravity	
		1950 2/	1951	1950	1951
		Bu.	Bu.		
M 304	L	368	466	1.100	1.073
Russet Rural	L	453	471	1.097	1.075
M804	L	347	435	1.092	1.071
303-4	L	350	469	1.092	1.075
Russet Sebago	L	409	437	1.091	1.066
M330	L	315	462	1.091	1.075
Kennebec	L	420	512	1.090	1.074
Russet Burbank	L	298	412	1.089	1.078
303-40	L	449	442	1.087	1.066
Sebago	L	385	498	1.085	1.068
M439	M	327	--	1.084	1.079
Katahdin	L	368	481	--	1.070
Ontario	L	427	505	1.080	1.068
Red Warba	E	413	611	1.079	1.068
Irish Cobbler	E	356	493	1.079	1.067
Essex	L	426	595	1.079	1.063
Red Pontiac	L	511	563	1.078	1.060
Lake	L	357	394	1.078	1.067
Triumph	E	432	631	1.077	1.064
Pontiac	L	465	633	1.076	1.057
Progress	M	296	481	1.076	1.064
Chippewa	M	428	517	1.075	1.063
K5	E	402	546	1.073	1.055

1/ Four randomized blocks, 25 hills per plot. Plot size 3 ft. x 25 ft.

2/ L.S.D. (.05) = 37 bu. per acre U.S. No. 1 (1950)

Potato Breeding

Potato-breeding operations were carried forward at Madison, Rhinelander, and Antigo. Breeding for resistance to common scab received continued emphasis, since this disease is the most important limiting factor in the production of high quality potatoes in Wisconsin. Special attention has been given to the problem of developing homozygous scab-resistant parental lines. The approach to this problem is similar to the methods which have been used successfully in the development of inbred lines of corn.

New Seedling Production

In greenhouses and cold frames 10,004 new seedlings were started. A total of 20 seedling families were grown from true seed. Of these, 14 families represented progenies from crosses between scab-resistant inbred lines and scab-resistant advanced-generation selections and 6 families represented progenies from selfed scab-resistant advanced-generation selections. This material will be increased at the University Potato Research Farm at Rhinelander.

First Clonal Generation Seedling Selections

Over 11,500 first clonal generation seedlings were grown and examined in the field at Rhinelander. Of this total, about 2,500 were Wisconsin seedlings, 3,000 Nebraska seedlings, and 6,000 Iowa seedlings. The seedlings of Nebraska and Iowa origin were included in the breeding program because sufficient greenhouse space was not available to start adequate seedling populations from true seed. The Wisconsin material included 8 families representing progenies from backcrosses designed to combine early maturity and resistance to scab. The greenhouse-grown seedlings from Iowa included 32 families and those from Nebraska included 87 families. About 800 selections were made for early maturity and good tuber type. This material will be tested for resistance to scab on the Antigo scab nursery during 1952.

Advanced Clonal Generation Selections

Disease-free seed stocks of advanced clonal selections are maintained on the Potato Research Farm at Rhinelander. Suitable quantities of seed varying from 5 hills to several hundred hills are grown for testing purposes. Approximately 1,200 selections and new varieties are tested annually for resistance to scab, specific gravity, yield, internal physiological necrosis, maturity tuber type and other horticultural characters. Two advanced-generation selections, D27.50 and D49.50, appear to be exceptionally promising. Selection D27.50 is an early-maturing scab-resistant segregate from a cross between Menominee and Wis. 302-6. Selection 49.50 is a medium-late scab-resistant segregate out of the same cross. These two selections are being increased for adaptation tests in various parts of the State.

Scab-resistance Trials

Scab indices, specific gravity determinations, and total yields for six advanced-generation selections and 4 varieties grown on the Gugel Farm at Madison are presented in Rieman table 2. Selections M439, M804, and M330 exhibited high resistance to scab. The specific gravity values for these three selections and 303-4 and M304 were superior to the four standard varieties. Selection M804 produced an exceptionally high yield of smooth oval-shaped tubers. The performance of selection M804 in this trial and in other trials is outstanding, and steps have been taken to increase disease-free seed stocks of the selection for release as a new scab-resistant variety.

Rieman table 2. Advanced-generation scab-resistance trials, 1951[1/]

Variety	Scab index [1/]	Specific gravity	Yield per acre
			Bu.
M439	23	1.072	328
M804	25	1.072	482
Ontario	25	1.066	427
M330	27	1.073	416
303-4	31	1.075	367
M304	36	1.074	391
Rus. Sebago	44	1.063	390
Katahdin	56	1.056	375
Cobbler	69	1.057	499
K5	82	1.056	480

1/ Trials grown on Gugel Farm, Madison.
Six 50-hill replicates. Scab index scale,
0 = scab-free
100 = all scabby.

WISCONSIN

Histological and Immunological Relations of Strains of Potato Leaf Roll Virus

R. W. Webb, R. H. Larson, and J. C. Walker,
Wis. Agr. Expt. Station, Madison, Wis.

Histological examination of stems of Physalis floridana Rydb., infected with four strains of the leaf roll virus showed a very high degree of correlation between the extent of phloem necrosis and the severity of external symptoms. The mild strain, No. 1, caused slight phloem necrosis only in isolated inner groups, and then very few cells of a group were affected. Cambial activity was slightly retarded in comparison with that of the control. Strain No. 2 caused more phloem necrosis and less cambial activity than strain No. 1. Severe external as well as internal phloem necrosis and severe disorientation of the stem tissues with greatly reduced and irregular cambial activity resulted from infection with strain No. 3. Almost complete destruction of the external and internal primary phloem, greatly reduced cambial activity, and internal modification of the stem tissues resulted in death of the plants infected by the severe strain, No. 4.

Four strains of potato leaf roll virus were found to immunize the host, P. floridana, against one another after the onset of macroscopic symptoms. All attempts to recover the immunized strain of the virus failed after a 7-, 14-, or 21-day incubation period in the host. In all cases only the immunizing strain was recovered from the inoculated test plants.

Incidence of Physiological Internal Tuber Necrosis

R. H. Larson, Wis. Agr. Expt. Sta., Madison, Wis.
R. V. Akeley, U.S.D.A., Presque Isle, Maine

Field tests for differences in susceptibility to the nonparasitic internal tuber necrosis in late-planted (June 5) potatoes were continued at the Hancock Station during 1951. Comparative indices of four seedling and five standard potato varieties are given in the Larson-Akeley table 1.

Larson-Akeley table 1. Reaction of seedling and potato varieties to internal tuber necrosis - 1951.

Variety	Internal necrosis index 1/
B606-67	5.8 2/
B73-10	9.1
B355-44	15.5
B76-43	22.9
Cherokee	1.7
Kennebec	9.4
LaSoda	16.1
Katahdin	45.6
Ontario	64.2

1/ Randomized sample of 300 tubers from a 200-ft. planting.
2/ 100 = All tubers with severe internal necrosis
0 = All tubers free of internal necrosis

Over a period of years a wide range of variation in relative susceptibility of potato varieties has been observed in the table stock area of central Wisconsin. However, severe losses sustained in the late-potato crop during certain seasons emphasize the importance of field trials of seedling material in search of adaptable, internal-necrosis-resistant potatoes.

Variation in Virulence and Properties of Potato Virus Y Strains

J. F. Darby, R. H. Larson, and J. C. Walker
University of Wisconsin, Madison, Wisconsin

To compare the virulence of a number of isolates of virus Y, from a wide geographical range, on selected American and foreign potato varieties was deemed desirable, since the differential reaction and relative resistance of potato varieties to virus Y are of major importance in breeding for resistance. The present study attempts to do this, in addition to determining the reactions of virus Y on various other solanaceous hosts, optimum temperature and age of plants for symptom expression, the relationships between isolates through serological and cross protection tests, and physical properties.

A collection of isolates of potato virus Y from various parts of the United States and Great Britain was made, and 18 were selected for intensive study. The optimum temperature for the expression of typical rugose mosaic symptoms in potato was near 24° C. The incubation period was shortened proportionately with the increase in temperature at 4° intervals from 16° to 28° C. The most severe but atypical symptoms were produced at the higher temperature. The optiumum age of potato plants for inoculation to obtain the most severe symptoms

was about one week.

The X-immune USDA Seedling No. 41956 responded to isolates of Y with a wide range of reactions, which consisted of few to many local lesions, mild to severe secondary symptoms, with one-half of the isolates eventually killing the plants.

Twenty-two potato varieties from the United States and two from Great Britain were compared by inoculating each variety in quintuplicate with each of the isolates. A variety disease mean was determined for each variety based on the average severity of symptoms produced by the 18 isolates. These calculated means were used as a basis for classifying the varieties into three groups: (a) The tolerant varieties with means between 25 and 40, which included Snow Drift and Arran Banner; (b) the moderately-susceptible varieties between 40 and 65, which included Placid, Cobbler, Majestic, LaSalle, LaSoda, Kennebec, Pontiac, Russet Burbank, Sebago, Green Mountain, Russet Rural, White Rose, Katahdin, and Essex; and (c) the susceptible varieties, with means between 65 and 80, which included Triumph, Chippewa, Red Warba, White Cloud, USDA Seedling No. 41956, and Ontario.

Calculated means were also determined, using as a criterion the average severity of symptoms incited by the isolates on the varieties. These isolate means were used as a basis for dividing the isolates into four groups: (a) The mild isolates with means between 40 and 50; (b) the medium isolates between 50 and 65: (c) severe isolates between 65 and 80; and (d) erratic isolates with a wide range of reactions.

Previously reported local lesion hosts were found to be unsatisfactory for detecting differences between isolates of virus Y or for determining physical properties.

Lycium rhombifolium (Moench) Dippel and Physalis turbinata Medic. were found to be local lesion hosts for most of the isolates, although not of practical value for quantitative work.

Datura meteloides Dunal, D. aegyptica L., and D. fastuosa L. were found to be immune to all strains of virus Y tested, and Datura metel L. was susceptible.

The isolates of virus Y, in combination with each of three potato X viruses, X^H, X^D, and X^{RS}, when inoculated to tobacco and incubated at 24° C. resulted in a mild spot necrosis reaction with X^H, moderate with X^D, and severe with X^{RS}. Virus X inhibition of Y in the production of spot necrosis on tobacco was evident when both viruses were inoculated simultaneously and lessened when X preceded Y by 24 hours. An improved spot necrosis technique was developed, which consisted of introducing selected strains of virus X into tobacco 24 hours previous to inoculation with Y. For showing differences between isolates of Y, the X^H strain was best, and for detecting the presence of Y, the X^{RS} strain was the most sensitive.

The weaker isolates of virus Y protected against the more severe isolates in both tobacco and potato.

The results of the physical property studies are summarized as follows: None of the isolates was infectious after heating for 10 minutes at 62° C., whereas all survived 54° C. All isolates remained infectious after 6 days storage in vitro at 20° to 22° C., but were inactivated after 18 days. Inactivation by dilution ranged from 1:10,000 to 1:759,000 with most of the isolates falling between 1:50,000 and 1:100,000 . When desiccated in tobacco leaf tissue and stored over calcium chloride at 4° C., all 18 isolates remained virulent up to 16 months at the last testing, but some showed signs of weakening.

Physalis virginiana Mell. and P. heterophylla Nees., naturally infected with virus Y, were found in the central Wisconsin potato area.

Abstract - Wis. Agr. Expt. Sta. Bul. No. 177, 1-36.
August, 1951.

WYOMING

Wm. A. Riedl, G. H. Starr, and Clarence M. Rincker

The work in Wyoming is devoted to the development of a red-skinned variety of potato resistant to scab and ring rot with good cooking and keeping qualities. Desirable red-skinned seedlings were crossed with varieties and seedlings resistant to scab and ring rot. Selections from these progenies and seedlings from other sources were tested for yield, specific gravity, and resistance to scab and ring rot.

Ring Rot Studies

Nine varieties and seedlings resistant to ring rot were tested. Six varieties showed no symptoms of ring rot in the vines. Three varieties showed 2.7, 3, and 12.1 percent of the plants, respectively, with questionable ring rot symptoms. The Bliss Triumph check had 94.9 percent of the plants showing symptoms of ring rot.

Naturally infected tubers of 6 varieties resistant to ring rot were planted in 40-hill rows. Riedl table 1 shows the percentage stand obtained and the percentage of plants showing questionable symptoms of ring rot.

Riedl table 1. Resistance to ring rot of six potato varieties as compared with Bliss Triumph.

Variety	Stand	Questionable plants with ring rot
	Pct.	Pct.
Teton	32	0.0
453	100	15.0
375	95	.0
364	97	2.6
420	95	15.8
422	100	18.2
Bliss Triumph	95	94.7 positive symptoms.

The tubers of the varieties resistant to ring rot have been saved and will be checked for ring rot. A random sample of tubers of the Teton variety produced in a similar trial in 1950 were planted in 1951, and out of approximately 500 plants no symptoms of ring rot were observed.

Three seedlings that didn't show any symptoms of ring rot in the 1950 trials were again tested. This year these varieties showed positive symptoms.

Tests have been conducted with seven seedling lines that have shown most resistance to ring rot over a period of years. In these tests, the best and most resistant hills have been harvested, replanted, and reinoculated the following year. In addition, two lines, Chenango and FBY-1, from the Cornell Agricultural Experiment Station (through F. L. Ashworth) have shown resistance to ring rot.

Scab-Resistance Test

Seventy-seven lines of potato seedlings, together with Bliss Triumph checks, were grown in scab-infested soil at the Agronomy Farm, Laramie, during the season of 1951. These lines were planted on June 2, 1951, in five-hill units, replicated three times, with check units randomized frequently throughout the plot. The tubers were harvested on October 8 and stored for a few days, then notes were taken on scab prevalence and type of pustule, relative yielding ability, and type of tubers. Twenty-nine lines were considered sufficiently good to warrant further testing in 1952. A few lines were especially good and are indicated in the accompanying table (Riedl table 2). Specific gravity readings were made after the potatoes had been in cold storage for approximately $3\frac{1}{2}$ months. These readings, together with the external tuber characteristics, are shown in table 2.

Variety Yield Trials

Sixteen varieties and 26 promising seedlings were grown in 3 yield trials at Laramie. These trials consisted of 60-hill rows replicated 4 times. The specific gravity was obtained on these varieties. The results of these trials are given in Riedl tables 3, 4, and 5. Potato variety yield trials were also conducted at the Torrington, Sheridan, and Powell Substations. These data have not been summarized.

At Laramie 66 seedlings were grown in a preliminary yield trial consisting of 25-hill rows without replication. Ten seedling varieties from Nebraska were grown in a uniform interstate yield trial.

Seed Observation

Sixty seedling selections were grown in 4-hill rows for observation.

First-Year Seedlings

Approximately 400 seedling lines were grown at Laramie. Several hundred selections were made from these lines for further observation.

Seedling Increase

At Laramie 26 promising seedlings were increased, and 12 were increased at the Torrington Substation. At Laramie 18 seedlings were selected for further increase and at Torrington 7 were selected for further increase.

Riedl table 2. Data on potato seedling lines grown in scab-infested soil, Agronomy Farm, Laramie, Wyo., 1951.

Wyoming number	State or U.S. number	Color	Scab		Yield	Type	Starch
			Prevalence 1-5	Type 1-5			
							Pct.
W 461	627-8	White	1	1	G-	M-	---
W 471	528-118	"	Trace	1	G	M-G	12.4
W 2107*	B 395-5	"	"	1	M-G	G	11.8
W 2116	Yampa	"	1-2	2	G	G	13.7
W 2121*	C 6364	"	Trace	1	M	G	----
W 2129	Ia.116-13	"	1	1-2	G	G	12.4
W 2140	104-2	"	Trace	1-2	M-G	G	16.1
W 2142*	CS 7285	"	"	1	G	G	15.0
W 2191	CS 7918	"	1-	1	M	M-G	14.4
W 2323	4700	"	1-	2	G	G	14.4
W 2351	9799	"	Trace-1	1-2	G	M-G	14.6
W 2354	10,184	Pink	Trace	1	M-G	M	14.6
W 2410	PI 160189	White	2	2	G-	G	----
W 2418	B 395-13	"	Trace-1	1-2	G-	G-	13.3
W 2420	6324	"	1	1-2	M-G	G	15.6
W 2422	6332	"	1-	1	G	G	13.1
W 2424	6403	"	Trace-1	1	M-G	M-G	12.9
W 2427	7308	"	1	1	M-G	M	12.7
W 2431	7803	"	1	1	M-G	M	14.1
W 2434	7702	Red	Trace-1	1-2	M	M-G	12.7
W 2436	8043	White	"	1-2	M	M-G	13.7
W 2437	8053	"	1-	1-2	G	M	15.0
W 2439	9727	Pink	Trace-1	1-2	M	G	----
W 2442*	9760	White	Trace	1-2	G	G	13.9
W 2443	9775	"	1-2	2	G	M-G	12.9
W 2447a	M 63-11	"	Trace-1	1	M	G	10.5
W 2542	Nebr.41-47-1	"	1	1	G	M	----
W 2544	" 122-47-3	Pink	1	1	M-	G	----
B.T. x 471 Wyo.		Red	Trace-1	2	G	M-G	9.6
B.T.	Check	Red	4	3-4	M+	G-	9.0

* Outstanding lines in general characteristics.

Riedl table 3. Potato variety trial, Laramie, Wyo., 1951

Variety	Yield per acre	U. S. #1 per acre	U.S. #1	Rank of U.S. #1	Starch content
	Bu.	Bu.	Pct.	Pct.	Pct.
Bliss Triumph	378	308	81	11	11.8
Progress	375	277	74	15	12.9
Red Pontiac	372	334	90	2	12.7
2089	371	333	90	2	14.4
Irish Cobbler	347	315	91	1	14.4
Kasota	336	284	85	8	13.5
Pontiac	330	289	88	4	12.2
Yampa	299	262	88	4	12.2
Red McClure	281	242	86	7	12.4
Teton	248	189	76	13	12.4
Katahdin	246	215	87	6	13.5
Red Warba	244	206	84	9	14.8
White Rose	230	157	83	10	10.9
Pearl	178	135	76	13	12.2
Russet Burbank	173	90	52	16	11.6
Russet Rural	160	129	81	11	11.4
Difference for significance at 5% point	71	65			

Riedl table 4. Potato seedling yield trial No. 1, Laramie, Wyo., 1951

Variety	Yield per acre	U.S. #1 per acre	Rank of U.S. #1	U.S. #1	Rank of U.S. #1	Starch content
	Bu.	Bu.		Pct.	Pct.	Pct.
2483	475	417	1	88	2	13.1
2480	417	358	2	86	4	10.7
2477	355	277	6	78	11	13.3
2485	354	305	3	86	4	11.2
Bliss Triumph	344	268	9	78	11	11.8
2479	339	304	4	90	1	10.3
2476	338	289	5	86	4	12.7
2475	333	236	14	71	15	13.8
2484	332	272	7	82	8	13.9
1951	327	256	11	78	11	13.9
2482	322	253	12	79	10	13.1
2481	317	263	10	83	7	14.4
2490	308	272	7	88	2	11.8
2474	300	245	13	82	8	11.4
2488	253	189	15	75	14	11.8
2486	231	142	16	61	16	11.6
Difference for signi-ficance 5% point	85	86				

Riedl table 5. Potato seedling yield trial No. 2, Laramie, Wyo., 1951.

Variety	Yield per acre	U. S. #1 per acre	Rank of U.S.#1	U.S. #1	Rank of U.S.#1	Starch content
	Bu.	Bu.		Pct.	Pct.	Pct.
2372	462	403	1	87	3	11.2
2381	458	380	2	83	7	10.3
Bliss Triumph	410	333	5	81	9	11.8
2491	399	334	4	84	6	14.8
Katahdin x 471-14	398	347	3	87	3	10.5
2154	342	295	7	86	5	11.6
627-103	321	257	8	80	10	13.3
2478	285	229	10	80	10	11.8
Katahdin x 471-13	260	228	11	88	1	10.5
Difference for significance 5% point	98	99				

WEST VIRGINIA
M. E. Gallegly

Potato-disease research by the Department of Plant Pathology and Bacteriology has turned more toward studies of late blight. Cytological studies on the nature of resistance to Phytophthora infestans have been initiated, seedlings and Solanum species are being screened for resistance to the various races of the fungus, and variety trials, including several of the late-blight-resistant varieties were conducted. A scab plot is maintained where susceptible varieties are eliminated. In addition, the department was instrumental in certifying a 10-acre field of Kennebec potatoes grown by the West Virginia Medium Security Prison Farm.

Late Blight

The cytological studies on the nature of resistance to the late blight fungus are being conducted by Mr. R. Pristou. The studies are not completed, but early stages of the work have shown that Phytophthora infestans zoospores germinate and produce an appressorium before penetrating leaf tissue. The process of zoospore germination, appressorial formation, and establishment of the primary mycelium in the epidermal cells or substomatal chambers may be completed 2 hours after the leaves were atomized with the zoospore suspension. The epidermal cells of both Cobbler (susceptible) and Kennebec (resistant) varieties were penetrated by the fungus.

The potato stocks maintained by the Departments of Horticulture and Plant Pathology have been or will be screened for resistance to the late blight races A, B, C, D, BC, and BD. In addition, numerous Solanum spp. supplied by Dr. Hougas have been screened by seedling inoculations in the greenhouse for resistance to all of the races except BC. Those resistant to these 5 races are PI Nos. 160224-2, 160230-9, 161158-9, 161169-1, 161169-5, 161175-2, 161175-4, 161178-10, 161179-5, 161181-7, 161281-7, 161365-5, 161365-9, 161366-5, 161366-9, (161728), and 161732-1. Those underlined are Solanum longipedicellatum; the one in parenthesis is a Solanum polyadenium; and all the others are Solanum demissum selections. Susceptible selections of S. demissum were numbers 161179-2 and 161179-3; susceptible S. longipedicellatum selections were numbers 161152-1, 161152-3, and 161170-7. Other species that were susceptible to the five races were S. chacoense (175401-1), S. catarthrum (175415-1), S. gibberulosum (189215), S. saltense (189217), S. schickii (189218 and 189219) and Solanum spp. near S. chacoense (189220 and 189221). S. demissum numbers 161165-1 and 161165-3 were resistant to races A, C, and D. With the completion of new greenhouses it is hoped that crosses involving resistance to these races will be more successful than they

were last year.

Variety Trials

The variety trials were conducted in the Tygart Valley near Huttonsville, W. Va. The growing season was warm and dry, thus late blight was not a problem. However, early blight was severe late in the season. All of the varieties were susceptible but the later-maturing varieties became diseased later than did the early varieties. There was some physiological tipburn present in the plots with the Kennebec variety being severely affected.

The field plots included 31 different varieties or seedlings. Each variety was randomized and replicated 6 times. Each replicate row was 20 feet long. They were sprayed 5 times with a mixture of zineb and DDT. Gallegly table 1 gives the percentage defoliation and yield of the 15 higher yielding varieties. Essex gave the highest yield, which was significantly higher than that from any of the other varieties.

Gallegly table 1. Percentage defoliation and yield of 15 potato varieties and seedlings.

Variety or number	Defoliation 95 days after planting	Yield of No. 1 potatoes per acre
	Pct.	Bu.
Essex	18	383
Sequoia	5	314
B 604-18	36	304
B 924-2	10	294
Pungo	23	278
B 313-21	36	272
B 47205	29	260
Ashworth	33	247
B 446-8	7	244
Sebago	9	236
X 96-44	45	235
Seneca	12	231
Kennebec	52	227
Cobbler	47	206
B 73-3	25	204
L.S.D. 19:1	--	55.1
99:1	--	72.7

In addition to the replicated trials, numerous other stocks were grown in 20-foot rows and observed for disease resistant characters. Some of these will be included in the replicated trials this coming summer.

Scab

Scab is not serious in most of the potato-growing areas of the State since the soil is naturally acid. A scab garden is maintained, however, where susceptible seedlings from parents with resistance are eliminated. Fifty-eight varieties and seedlings were included in the garden in 1951. The resistant selections will be included in the garden the following year for further tests.